The information in this booklet must not be given to the public

British Rail | Train Crew Manual

Class 58 Locomotives

General Information & Driving Instructions

Issue 3
Supersedes Issue 2

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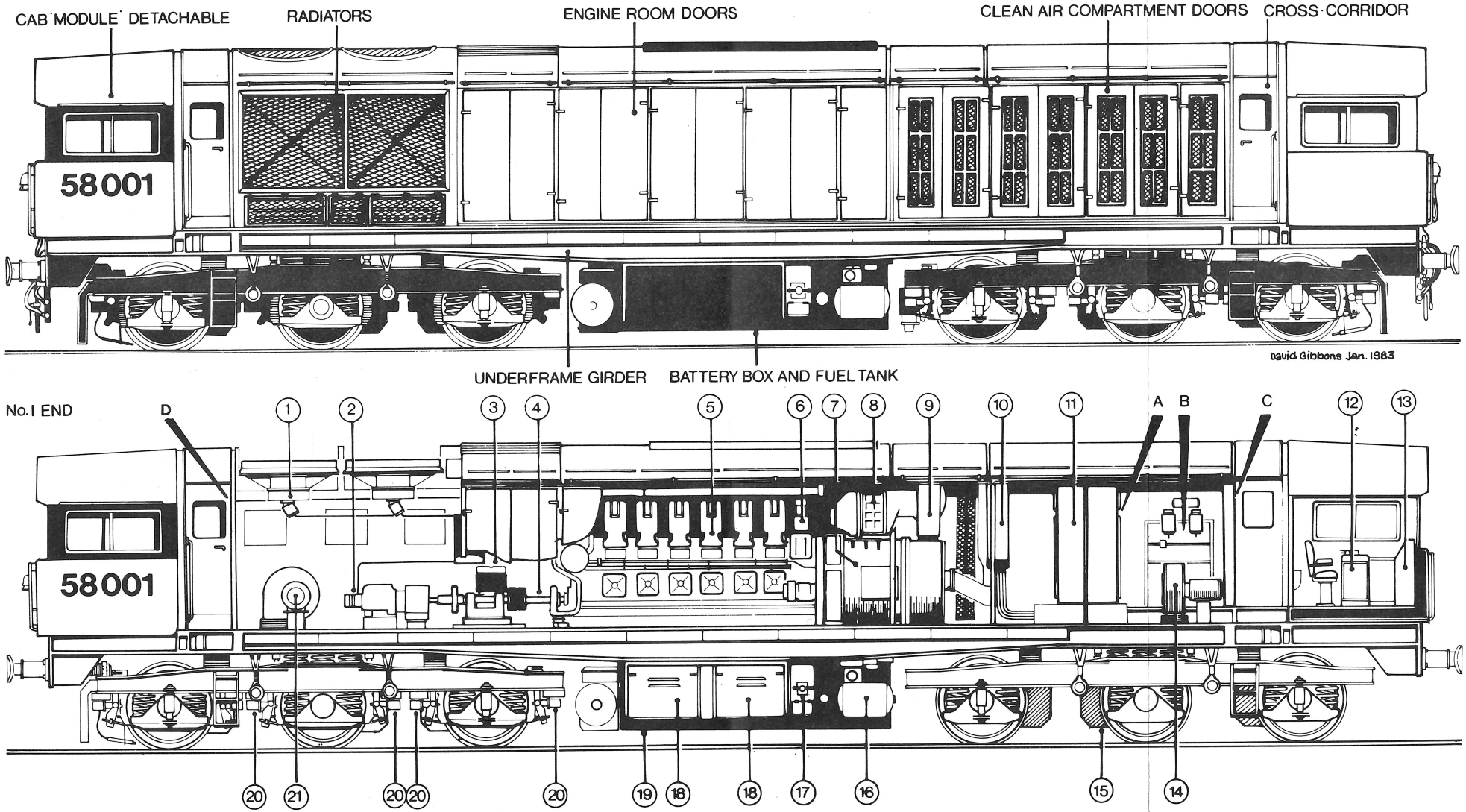
Fig. 1 Class 58 Freight Locomotive



1. Hydrostatic (oil) fan drive motor (one of two)
2. Hydrostatic (oil) pump for fan drive motors
3. Air compressor (one of two)
4. Drive shaft for air compressors (belt driven) and hydrostatic oil pump
5. GEC-Ruston RK3 ACT V formation, 12-cylinder diesel engine (3,300bhp)
6. Engine governor
7. Alternators (main and auxiliary)
8. Turbo-charger and intercooler
9. Engine air intake filter
10. Rectifier
11. Control cubicle
12. Power controller pedestal
13. Instrument panel
14. Tractor motor blower, No. 2 bogie
15. Brush TM 73-62 traction motor one of six)
16. Air reservoir
17. Battery isolating switch. Fire pull above, assisted start terminals below
18. Battery
19. Fuel tank
20. Combined service and parking brake cylinders (fitted to axles 2 and 3 only)
21. Traction motor blower, No. 1 bogie. The following equipment accessed via cross-corridor - at No. 2 end only.

A Main m.c.b. and switch panel
B Air reservoir, brake equipment and isolating cocks
C Fuses and parking brake pump unit
D Radiator fan control box.

Fig. 2 Class 58 Dimensions

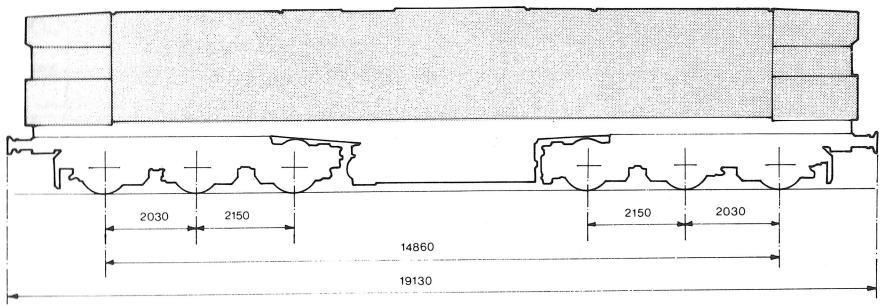
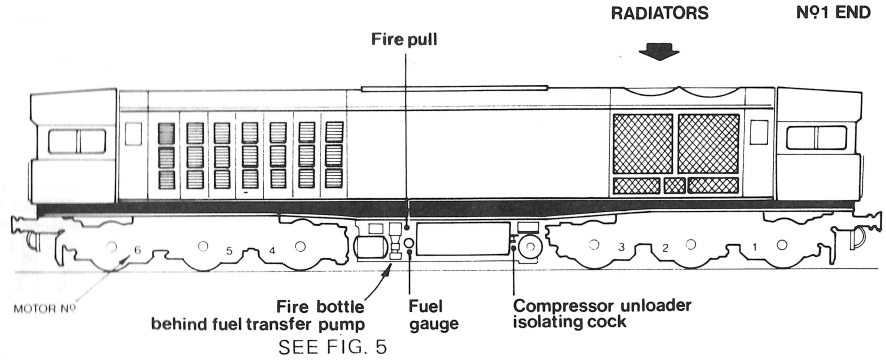


Fig. 3 Right Hand Side



SEE FIG. 5

Fig. 4 Left Hand side

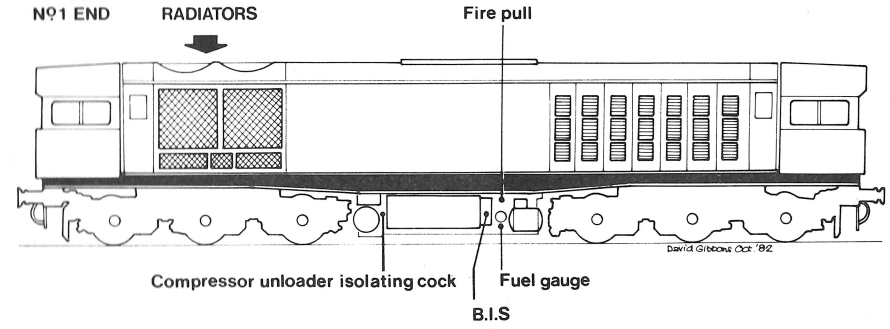


Fig. 5 Right hand side; fire fighting & fuel

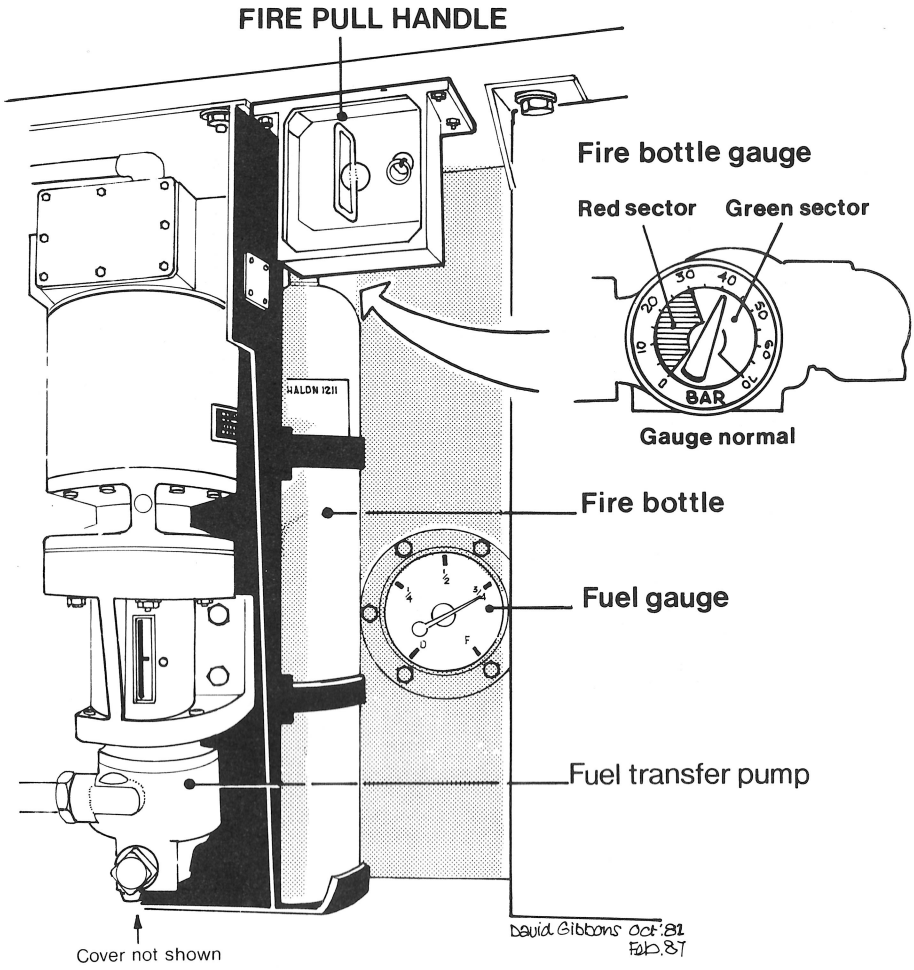
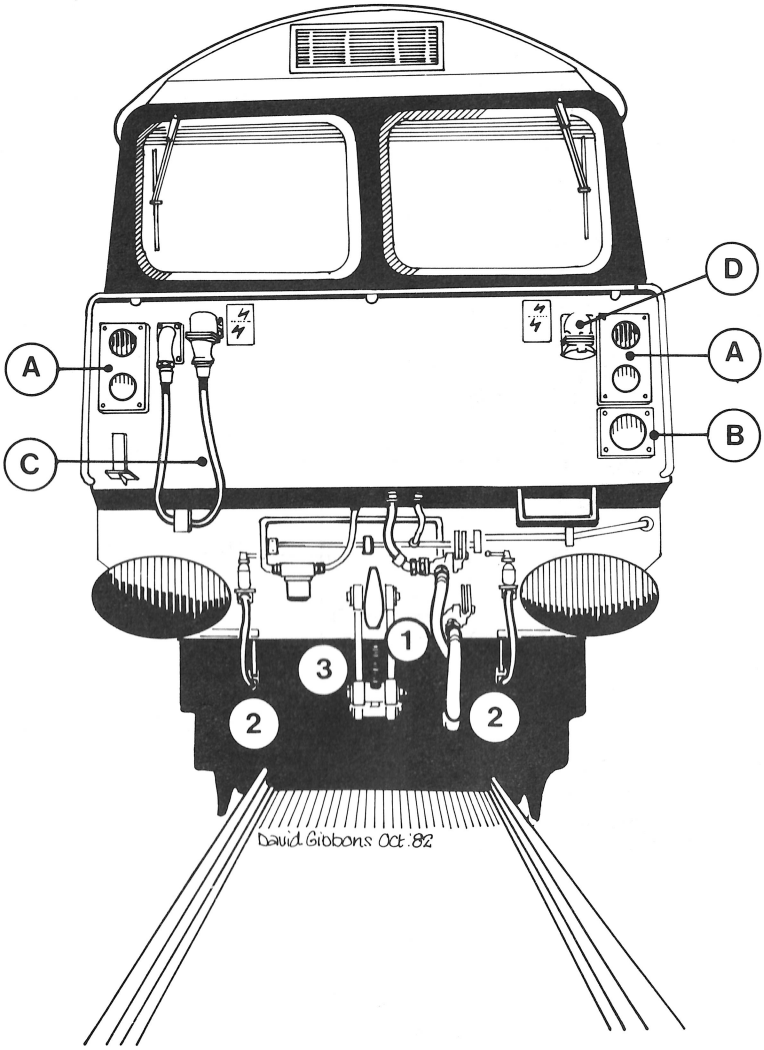


Fig. 6 Front end

A Tail and marker lights
B Headlight
C Control jumper cable
D Socket

1 Brake pipe & main res. pipe
2 Regulating air pipes
3 Hook for coupling



The layout of the driving compartment is depicted thus:

Fig. 7	page 9	Driving position – general view
Fig. 8	page 10	Instrument panel – detail
Fig. 9	page 12	Power control pedestal – detail
Fig. 10	page 13	Braking controls – detail

2.1 Driving position (Fig. 7)

This is arranged so that the braking controls are grouped to the left of the Driver whilst the power controls are to the right.

The driving compartment is provided with horizontal sliding side windows and above these on the left hand side are situated the brake control and lighting switches, reading from left to right:-

Cab lights	Desk light	Dim Bright Instrument lights	Demister
Head light	Marker lights	L.H. R.H. Tail lights	Brake control 'service' UP 'isolate' DOWN

Heating and ventilation is controlled by a switch below the instrument panel with positions:-

Fan Only	(to circulate fresh air)
Off	
Heat	(to circulate warm air)

A lever is provided below the switch to enable the individual to adjust the degree of heating to his own requirements, from COOL to WARM.

2.2 Instrument panel (Fig. 8)

The various gauges and fault and indicator lights are recessed into the fascia of the panel, the lights being Light Emitting Diodes (L.E.D.) instead of the traditional lamps.

2.2.1 Air pressure gauges – from left to right:-

M.R.	–	main reservoir	normal duplex gauges
M.R.P.	–	main reservoir pipe	
Bogie 1 Bogie 2	–	brake cylinder pressures	
Brake pipe control	–	OUTER SCALE	duplex type gauge but centre needle for inner scale, the other around the circumference the outer scale
Brake pipe	–	INNER SCALE	

2.2.2 Speedometer – scaled 0 to 100 m.p.h.

MAXIMUM SPEED OF THE LOCOMOTIVE 80 M.P.H.

2.2.3 Slow speed selector switch

Position 1 – 0.5 m.p.h.

2 – 1.0 m.p.h.

3 – 2.7 m.p.h.

4 – This will provide a 'balancing speed' according to the load of the train against the traction power available with the engine at idling r.p.m. On an average gradient this position will produce a speed of, say, 7 to 8 m.p.h. to assist in moving away a heavy train when the rail conditions are poor i.e. there is a possibility of wheel slip. Since traction power has to be shut off to enable normal power control to be resumed this 'balancing speed' will normally provide sufficient momentum to keep the train moving during the changeover from slow speed to normal traction power control.

Fig. 7 Driving position

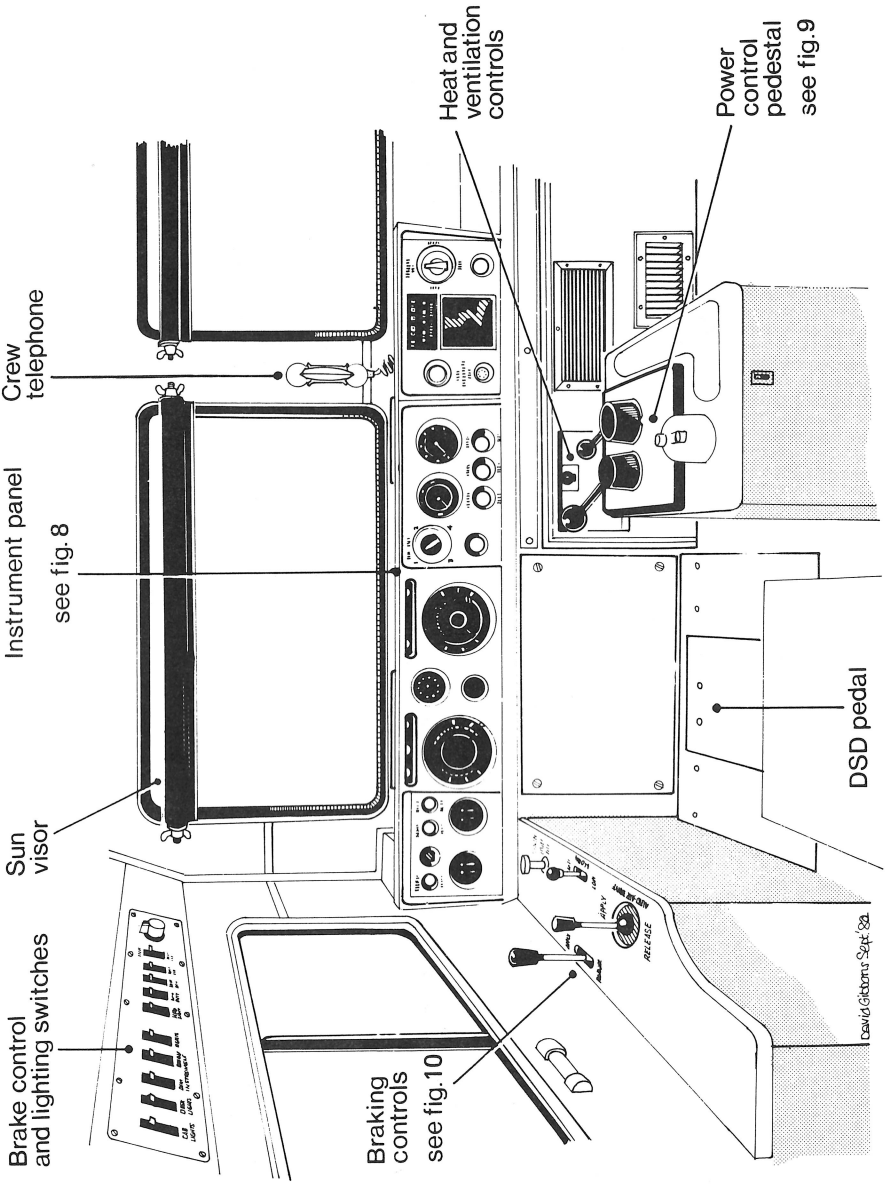
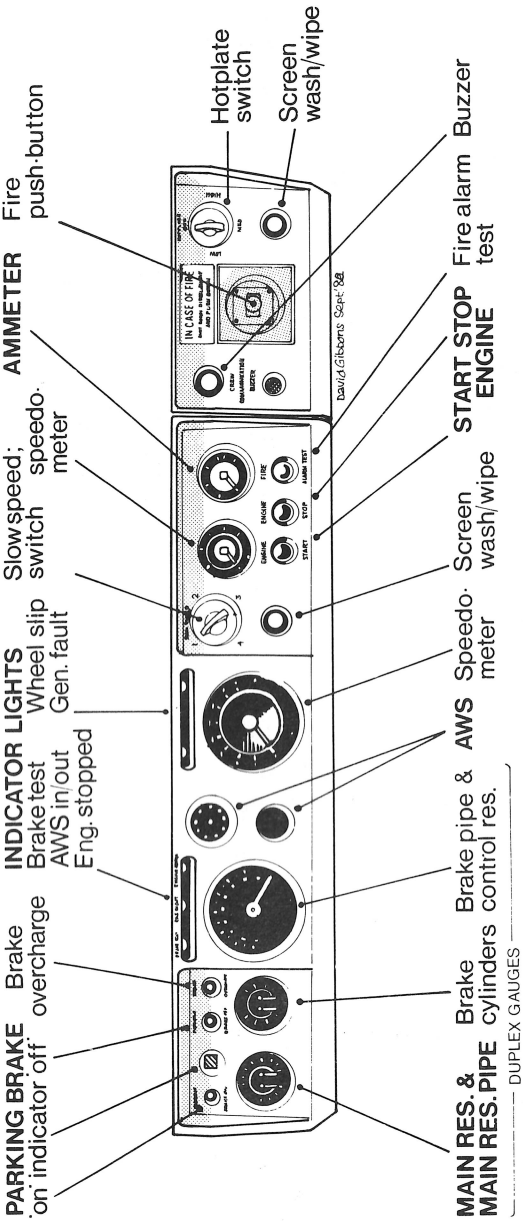


Fig. 8 Instrument Panel



2.2.4 Slow speed speedometer – scaled 0 to 3.0 m.p.h.

2.2.5 Ammeter – scaled 0 to 5 kA i.e. kiloamps.

2.2.6 Indicator lights – these show YELLOW for the 'normal' indicator and RED for 'abnormal' and will automatically dim when the driving compartment is in darkness.

2.3 Power controller pedestal (Fig. 9)

The master switch is unlocked by a standard master key inserted in the right hand side of the 'turret', and has the normal OFF, REVERSE, ENGINE ONLY & FORWARD positions.

The power controller incorporates the sander push button and, when the master switch is at ENGINE ONLY, can only be opened part way. This is achieved by a mechanical 'stop' attached to the shaft of the master switch.

The slow speed switch is located on the side of the pedestal, just below the A.W.S. reset button, with SLOW SPEED and NORMAL positions.

2.4 Braking controls (Fig. 10)

The standard automatic air brake is fitted but the brake pipe pressure control system is based on the S.N.C.F. Poussoir Bouton Locomotive (P.B.L.) arrangement, which is described in detail elsewhere. So far as the braking controls are concerned the conventional automatic air brake valve is replaced by a controller of the 'joystick' type, similar to the warning horn control valves in appearance although larger. Basically this is pushed forward to APPLY the brake and pulled to the rear to RELEASE the brake and when released it returns automatically to the centre LAP position. The degree of brake application or brake release is determined by the length of time that the brake controller is HELD in the APPLY or RELEASE position, when the required degree is observed on the brake pipe gauge then the controller is released to return to the LAP position and so hold that particular degree of application (or release). Control of the brake pipe pressure is achieved by electro-pneumatic (E.P.) valves and the automatic air brake controller is basically an electric switch.

To conform, the locomotive direct air brake valve is of a similar pattern, but is NOT designed to return automatically to the centre LAP position if released. To apply the direct/straight air brake the

Fig. 9 Power Controller Pedestal

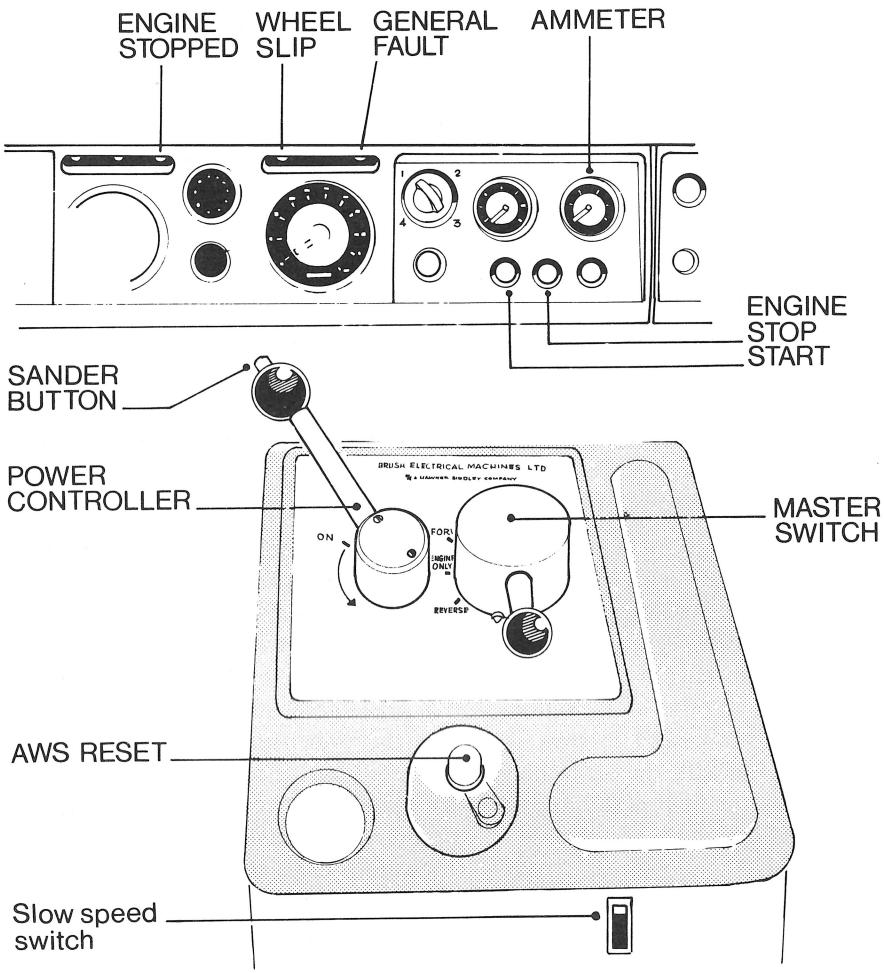
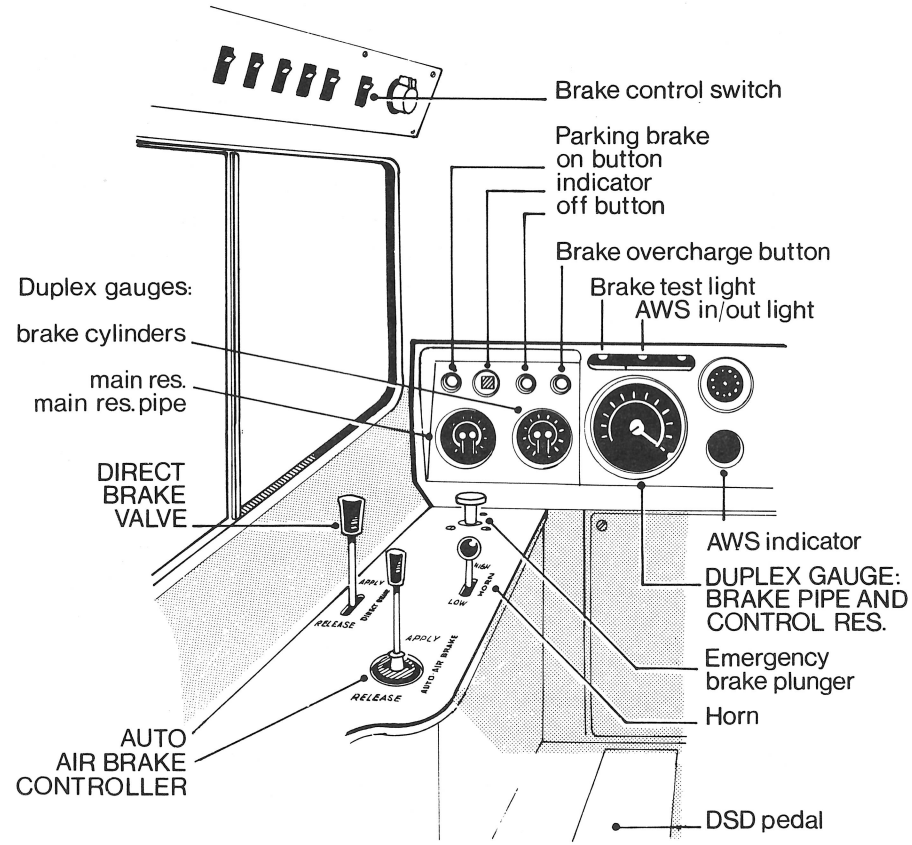
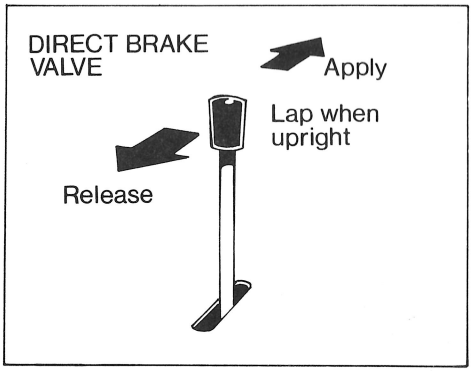
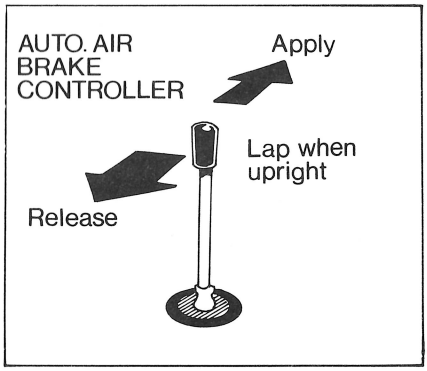


Fig. 10 Braking controls







valve handle is pushed forward to allow air to pass from the main reservoir system to the brake cylinders until the desired pressure is indicated on the gauge, whereupon the brake valve must be moved back to the centre LAP position to maintain that brake application. To release the locomotive direct air brake the brake valve must be moved to the rear RELEASE position and then moved back to the centre LAP position if only a partial release is required. The direct air brake valve itself controls the passage of air to and from the locomotive's brake cylinders i.e. there are no relay valves. The brake valve should be left at RELEASE in all driving compartments and NOT returned to the centre LAP position when the direct air brake has fully released.

The brake control switch is normally placed in the SERVICE ('up') position in all driving compartments and is moved to the ISOLATE ('down') position for the duration of the brake continuity test. If, upon completion of the test, the brake control switch is NOT returned to the SERVICE position the automatic brake will not release when the brake controller is moved to the RELEASE position. The position of the brake control switch is 'repeated' by the brake test indicator light on the instrument panel in the driving compartment, which will display YELLOW when the switch is at SERVICE and RED when the switch is at ISOLATE – to serve as a reminder to the Driver.

A brake overcharge push button is provided on the instrument panel and once depressed the cycle of application and release of the overcharge pressure is fully automatic and requires no other action on the part of the Driver. The button need be depressed momentarily and then released – it does not have to be held depressed as on earlier traction units.

The emergency brake valve plunger vents the brake pipe direct to atmosphere when depressed and can only be reset by pulling the plunger back up to the 'raised' position.

3. NO. 2 END OF THE LOCOMOTIVE

The interior layout is depicted in Fig. 11 page 16.

3.1 Cross corridor (Fig. 12 page 17).

3.1.1 Three RED indicator lights (L.E.D's) for water level:

NORMAL – level adequate

FILL – header tank requires 'topping up'

EMPTY – header tank below 'minimum' level, engine has shut down or cannot be started.

These will illuminate according to the position of the water level switch in the coolant header tank.

3.1.2 Three fuses and two spares:

Lighting fuse 1	25 amp – Positive	If either rupture no internal or external lighting will be available.
Lighting fuse 2	25 amp – Negative	
Auxiliary Neutral fuse	25 amp –	If this ruptures output of both main and auxiliary alternators will be lost i.e. loss of power, and the engine will stop.

3.1.3 Battery Charge Ammeter
0 - 150A Charge/0 - 150A Discharge

If a degree of discharge is registered when the engine is running then check the Battery Charge MCB (BCB) - see page 22.

3.1.4 Hydraulic parking brake equipment cupboard – see Section 7 page 35.

3.2 Clean air compartment - Left hand brake frame (Fig. 13 page 18).

3.2.1 M.C.B. and switch panel (Figs 14 & 15 pages 20 & 21).

M.C.B. and effect of their 'tripping':

Hotplate HPB	–	Neither hotplate available for use
Demister DMB	–	No demisters in either end
Cab Heater 1 CHB1	–	Electric heating not available in the appropriate driving compartment .
Cab Heater 2 CHB2		
Cab Heater 3 CHB3	–	Heating (from the engine coolant system) not available in either driving compartment.

Fig. 11 Interior layout at No. 2 end

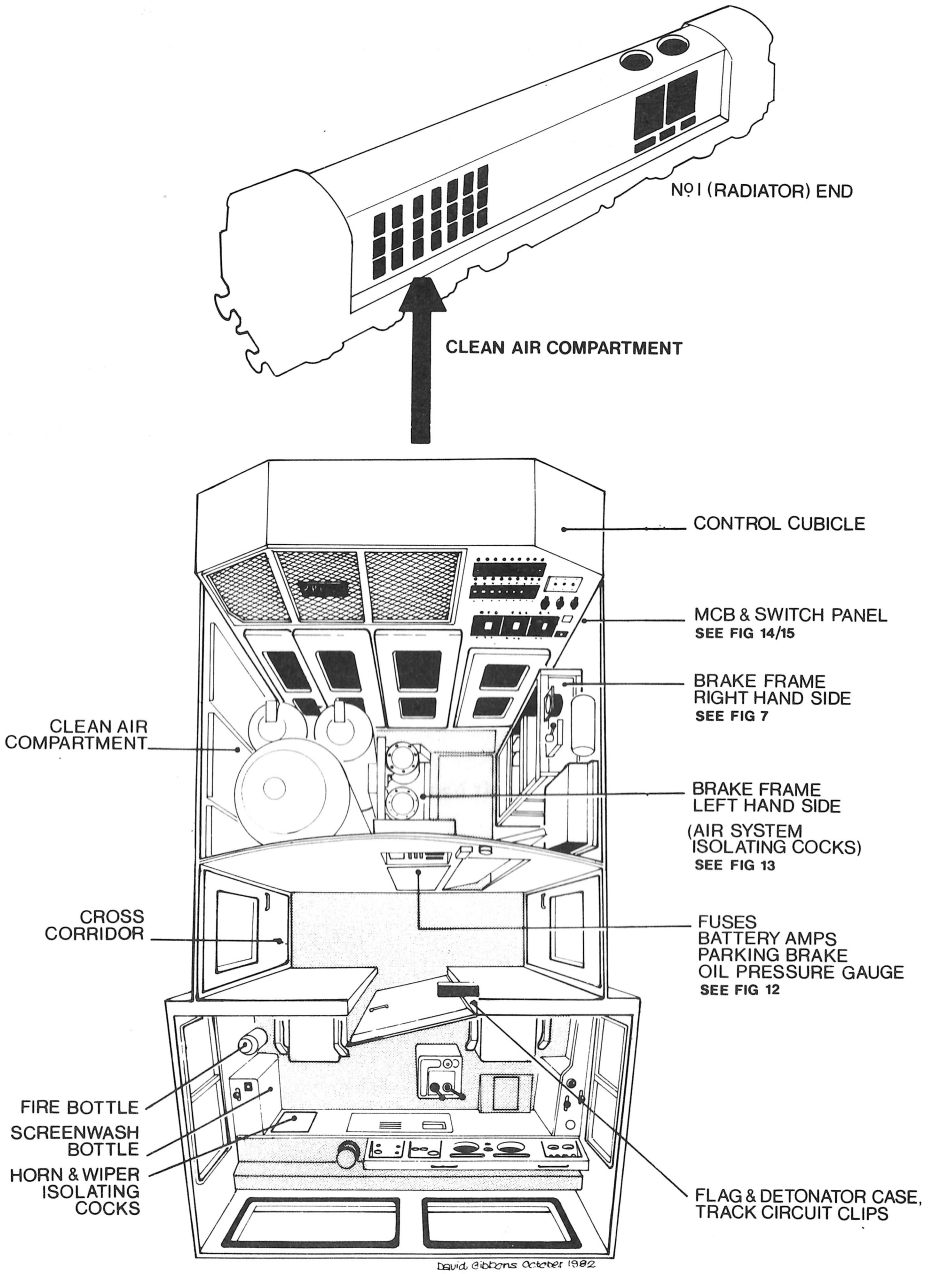
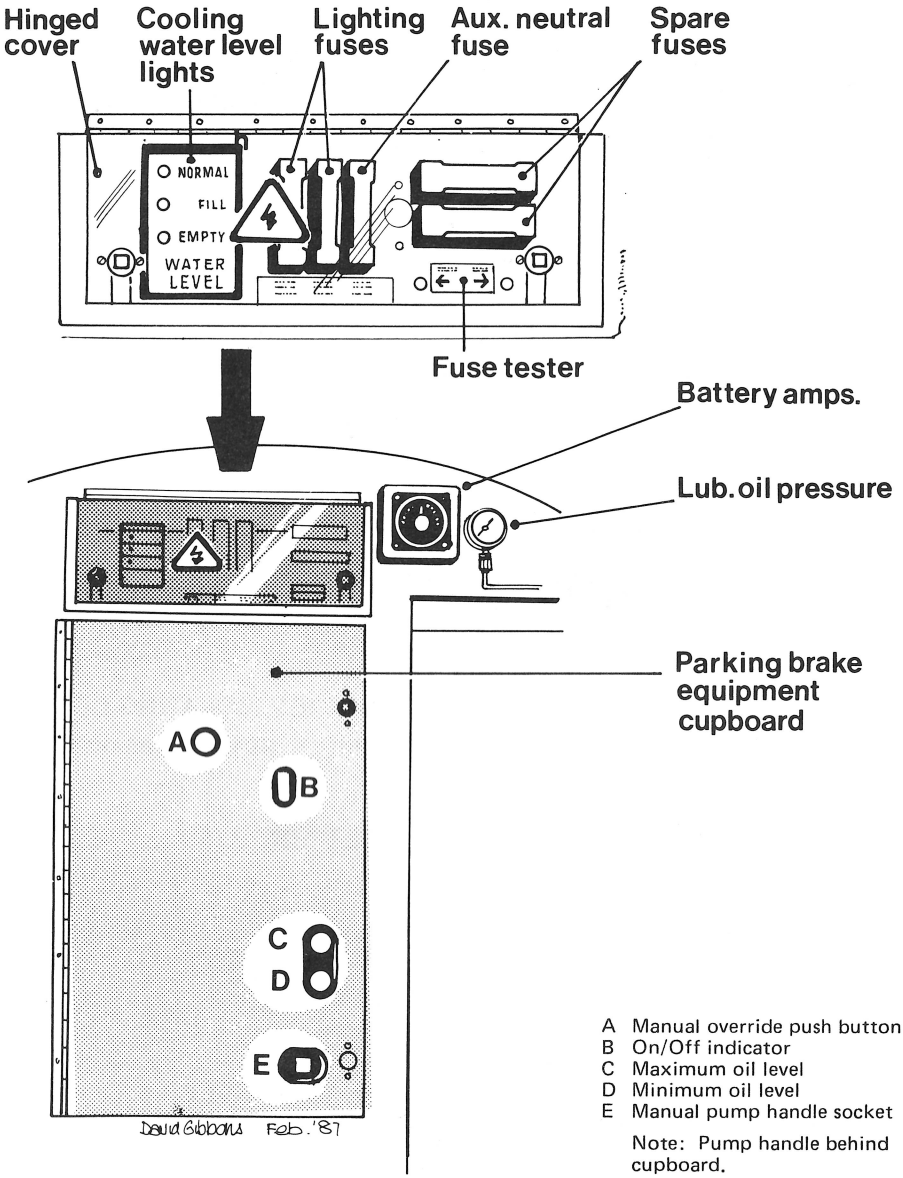


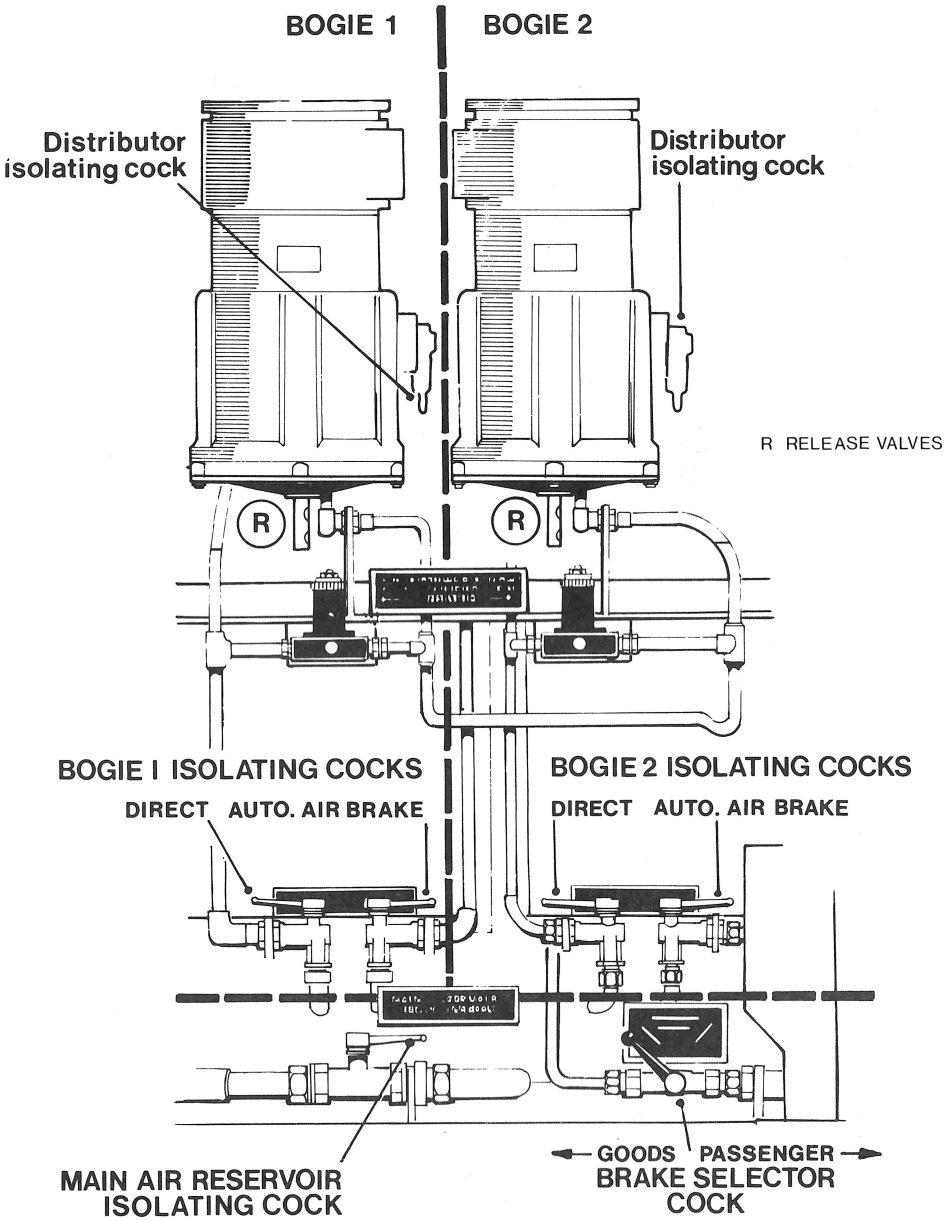
Fig. 12 Cross corridor at No. 2 end



A Manual override push button
B On/Off indicator
C Maximum oil level
D Minimum oil level
E Manual pump handle socket

Note: Pump handle behind cupboard.

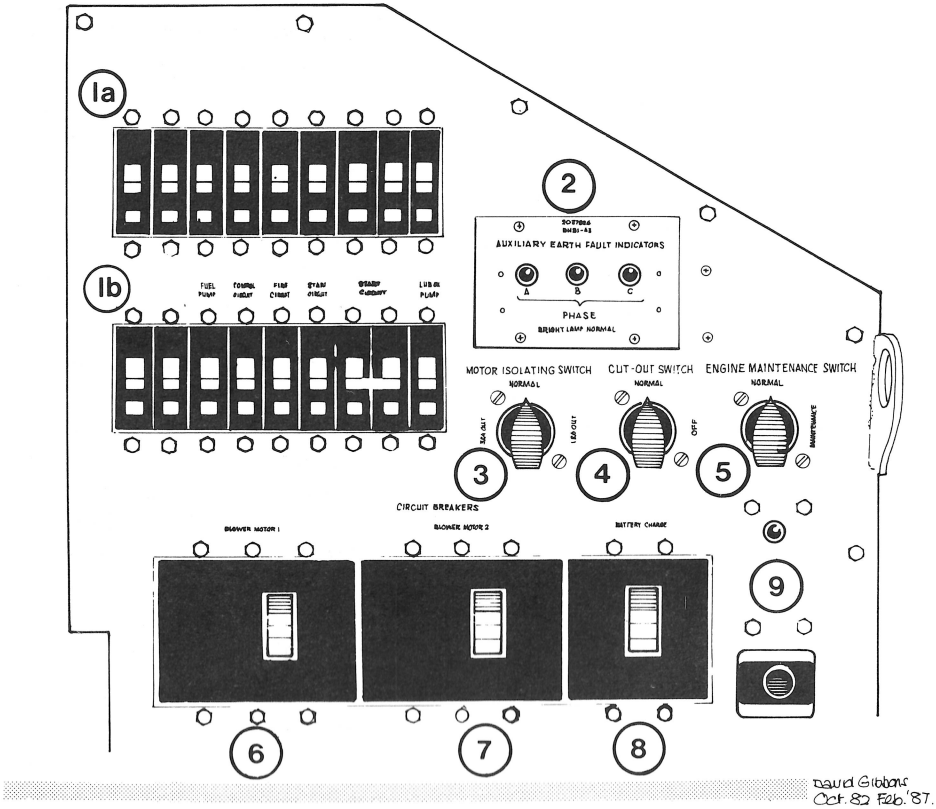
Fig. 13 Brake frame - Left hand side



Brake Control BB	–	De-energises full service switch in brake pipe pressure control unit to give a full service brake application and then unable to recharge the brake pipe.
Parking Brake PBB	–	Unable to apply or release the hydraulic parking brake electrically.
Automatic Warning AWB	–	Brake application through the AWS equipment.
Communication Equipment CEB	–	Loss of communication between driving compartments
Lighting Circuit 1 LB1 Lighting Circuit 2 LB2	–	If either 'trips' half the interior and exterior lighting will be extinguished at both ends of the locomotive e.g. there would still be one marker light and one tail light operable at No.1 end if LB1 'trips', these being supplied through LB2. The fuse test point in the cross corridor will itself be 'dead' if LB2 has 'tripped'.
Fuel Pump FPB	–	The engine will shut down through fuel starvation.
Control Circuit CCB	–	The engine will stop, instrument panel indicator lights are extinguished, brake application through the D.S.D.
Fire Circuit FB	–	The fire bells will ring and the Fire push buttons in the driving compartments are inoperative i.e. no electrical supply.

NOTE: The external Fire Pull handles are still operable (see figs. 3 & 4 page 4) as these are mechanically coupled to the firing head of the main fire extinguisher bottle.

Fig. 14 MCB and Switch panel locomotives 58001-58049

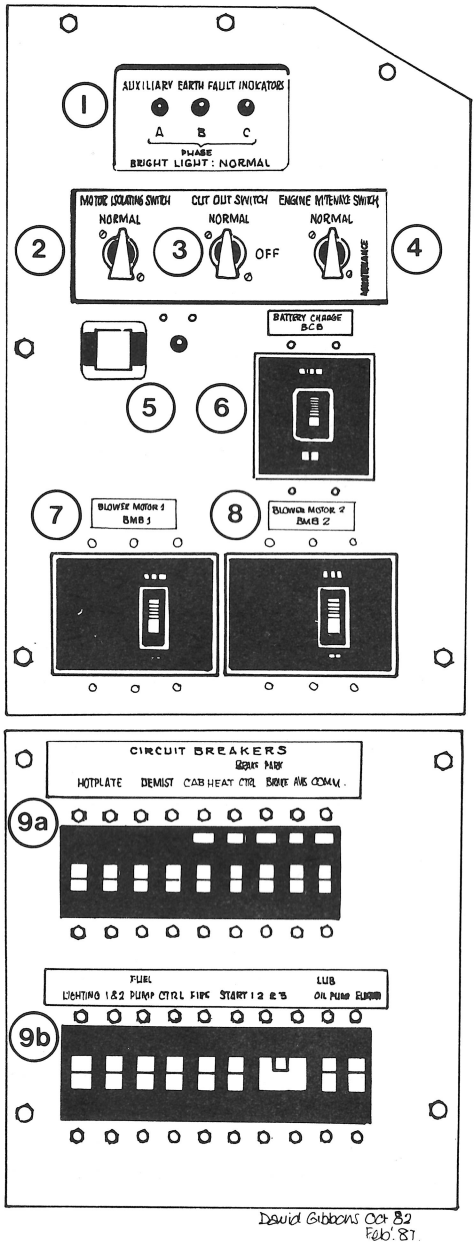


MCB AND SWITCH PANEL

KEY TO ILLUSTRATION

1. MCB's (left to right)
1a. Hotplate, Demist, Cab heat, Brake control, Parking brake, AWS.
1b. Lighting (2), Fuel Pump, Control, Fire, Start 1, 2 & 3, Lub. oil pump.
2. Auxiliary earth fault indicator lights.
3. Traction motor isolating switch.
4. Control cut out switch.
5. Engine maintenance switch.
6. Motor blower 1 MCB.
7. Motor blower 2 MCB.
8. Battery charge MCB.
9. Low battery volts indicator & reset push button.

Fig. 15 MCB and Switch Panel Locomotive 58050



KEY TO ILLUSTRATION

1. Auxiliary earth fault indicator lights.
2. Motor isolating switch.
3. Control cut out switch.
4. Engine maintenance switch.
5. Low battery volts indicator and reset push button.
6. Battery charge MCB.
7. Blower motor 1 MCB.
8. Blower motor 2 MCB.
9. MCB's (left to right).

9a. Hotplate, Demist, Cab heat, Brake control, Parking brake, AWS.

9b. Lighting (2), Fuel pump, Control, Fire, Start 1, 2 & 3, Lub. oil pump, Electronics.

Start Circuit SCB1 Start Circuit SCB2 (2 mcb's 'ganged')	–	Starter motors inoperative
Lub. Oil Pump LPB	–	The lub. oil priming pump will not run but the engine should start.
Electronics ECB (58050 only)		Loss of traction power. General fault light RED, reverts to YELLOW when power controller is closed. Unless MCB can be reset locomotive is a failure.
Blower Motor 1 (BMB1) Blower Motor 2 (BMB2)	–	Engine r.p.m. is automatically reduced thereby reducing traction current and hence protecting the traction motors from overheating through loss of their cooling air from the blower.
Battery Charge BCB	–	No charge to the battery and battery will discharge according to its condition at the time of the BCB 'tripping' and the load upon it. Locomotive can remain in service for a limited period if BCB will not reset but low battery voltage will eventually lead to a brake application through de-energisation of the brake pipe pressure control unit.

NOTE: BMB 1, BMB 2, and BCB are three position circuit breakers. OFF is 'up', TRIPPED is 'middle' and ON is 'down'. To reset the breaker must first be moved to OFF and then to ON.

Indications and Switches:

Low Battery Voltage Indicator and reset button	–	The RED indicator light (L.E.D.) will illuminate if the battery voltage falls below 24 volts to safeguard the starting equipment if the batteries have become severely discharged. The engine then will not turn when the start button is pressed. The Low Battery Voltage Relay (LBVR) is

latched and may be reset by depressing the button below the indicator light when voltage has been restored.

NOTE: The battery isolating switch must be CLOSED since the reset feature is electrically operated.

NOT MORE THAN THREE ATTEMPTS TO RESET AND START THE ENGINE ARE PERMITTED, AFTER WHICH THE LOCOMOTIVE IS A FAILURE.

Auxiliary Earth Faulty Indicators (A, B & C Phase) – These are normally BRIGHT with equal intensity when the engine is running, one for each phase of the auxiliary alternator. If any one is dimmer than another an auxiliary earth fault is indicated which must be reported in the Repair Book.

Motor Isolating Switch (NORMAL, 1–6 OUT, 2–5 OUT, 3–4 OUT) – Enables traction motors to be isolated electrically in the pairs indicated. - see Fig. 16 page 25. Protects those remaining by (a) preventing any further field diversion from taking place, and (b) restricting engine r.p.m. and hence traction current.

Cut Out Switch (NORMAL, OFF) – For use when working in multiple with another Class 56 or 58 locomotive. By moving the switch to OFF on the faulty locomotive the control equipment on that locomotive is isolated and the fault indications in the driving compartment in use will revert to YELLOW (Class 58) or BLUE (Class 56) i.e. normal.

Engine Maintenance Switch (NORMAL/ MAINTENANCE)	–	Enables maintenance staff to increase engine r.p.m. without traction current being obtained.

3.2.3 Right hand brake frame (Fig. 17 page 27).

Pressure switches :

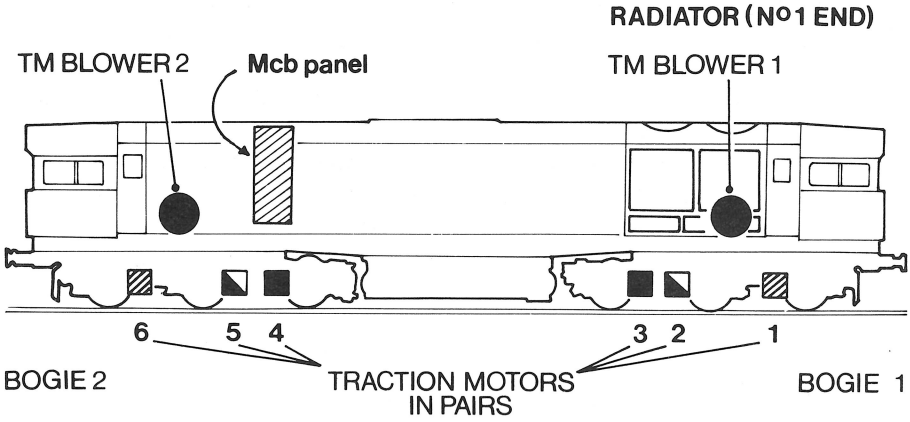
Brake pipe governor	–	Contacts close at 4.3 bar rising enabling power to be obtained. Contacts open at 3.4 bar falling to cut off power.
Main reservoir governor	–	Contacts open at 6.0 bar rising enabling power to be obtained. Contacts open at 4.5 bar falling to cut off power and initiate a brake application through the D.S.D.

4. THE POWER UNIT & AUXILIARIES

4.1 The diesel engine is a Ruston 12 cylinder 'V' form unit designated 12RKCT rated 2460kW (3300HP) at 1000 r.p.m. which has been under development for some time fitted to Class 47 locomotive 47901. It represents a considerable advance on that fitted to the Class 56 locomotives, which have a 16 cylinder (16RK3CT) engine rated at 2424kW (3250HP) although having a nominal rating of 2623kW (3520HP). Thus the 12RKCT engine produces the power needed for freight working from 12 cylinders instead of 16, and this ability has a significant effect on the capital and maintenance costs of an engine. There are further savings in that only one turbocharger (and less air ducting) is required, against two on the 16RKCT.

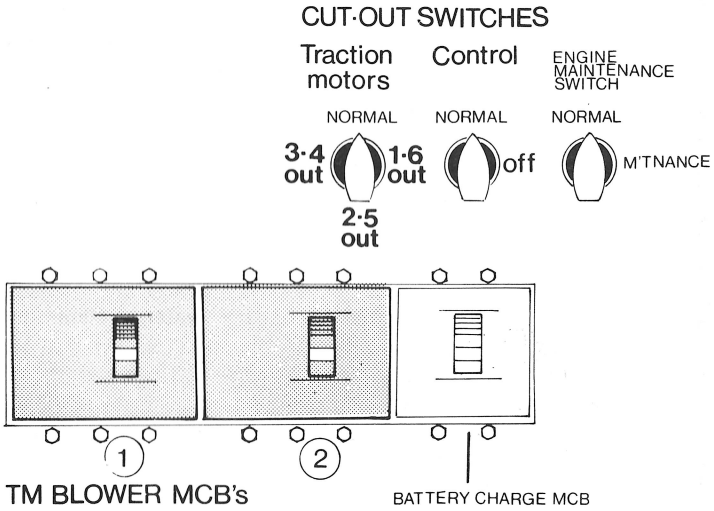
4.2 The engine is started by two starter motors and if the engine does not turn and fire within 30 seconds the starter motor pinions will automatically disengage. The starting sequence may be repeated but, if the starter motors become overheated, a thermal protection device will prevent them from re-engaging with the pinions until their temperature has become sufficiently reduced.

Fig. 16 Traction motor location



Cut-out switches

AND BLOWER MCB's
ON MCB AND SWITCH PANEL



4.3 The main alternator and auxiliary alternator is an integral unit coupled directly to the engine, the output from the main alternator being rectified to direct current (d.c.) to supply the d.c. traction motors.

4.4 Power control is conventional (see Fig. 18 page 28), in that the setting of the driver's power controller handle determines the pressure of regulating air supplied to the diesel engine speed governor to increase or decrease the engine r.p.m. The engine speed governor is linked to the load regulator which in turn is linked to the exciter of the main alternator to govern the alternator output to match that of the diesel engine.

4.5 Auxiliary power is provided by the auxiliary alternator (see Fig. 18 page 28), the three phase a.c. output being monitored by the Automatic Voltage Regulator (A.V.R.) linked to the exciter and supplied direct to the two traction motor blowers. The output is also fed to a transformer, rectifier and battery charger to provide the 110 volt d.c. supply to the remaining electrically-powered auxiliaries.

4.6 A drive shaft from the free end of the engine carries pulleys from which the two compressors are belt driven and, on locomotives 58001 - 58030 and 58032 - 58035, connects to a hydrostatic oil pump for the radiator fans.

On locomotives 58031 and 58036 - 58050 the radiator fans are driven through a gearbox connected to the drive shaft, with an electromagnetic clutch to engage/disengage them when required. A Radiator Fan Control Box has been provided in No. 1 end cross corridor which houses the Radiator Fan MCB (FCB 1) with OFF ('up') and ON ('down') positions and Override Switches OFF/ON for J/W (Jacket Water - engine) and S/W (Secondary Water - intercooler & turbocharger).

The fan for the secondary water system starts to run when the temperature reaches 35 degrees C, whilst that for the jacket (primary) system starts at 90 degrees C.

The Override switches are provided for maintenance purposes but may be used by the Driver under high water temperature fault conditions if he suspects that either or both of the fans are not running.

Fig. 17 Brake frame, right hand side

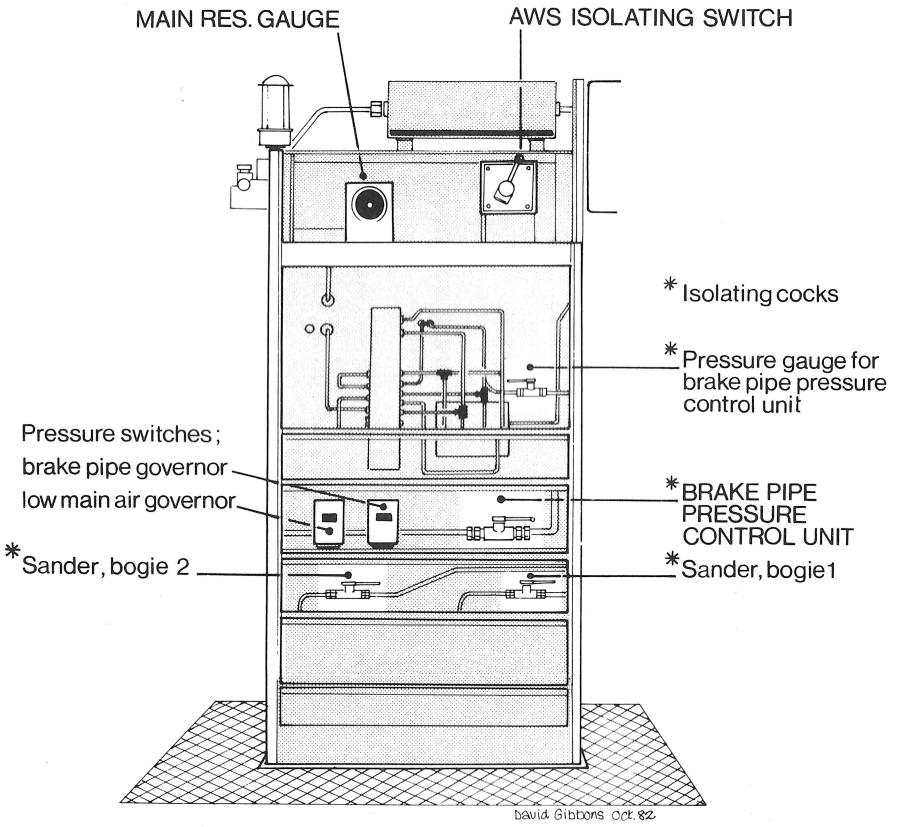


Fig. 18 Introduction to Power Control

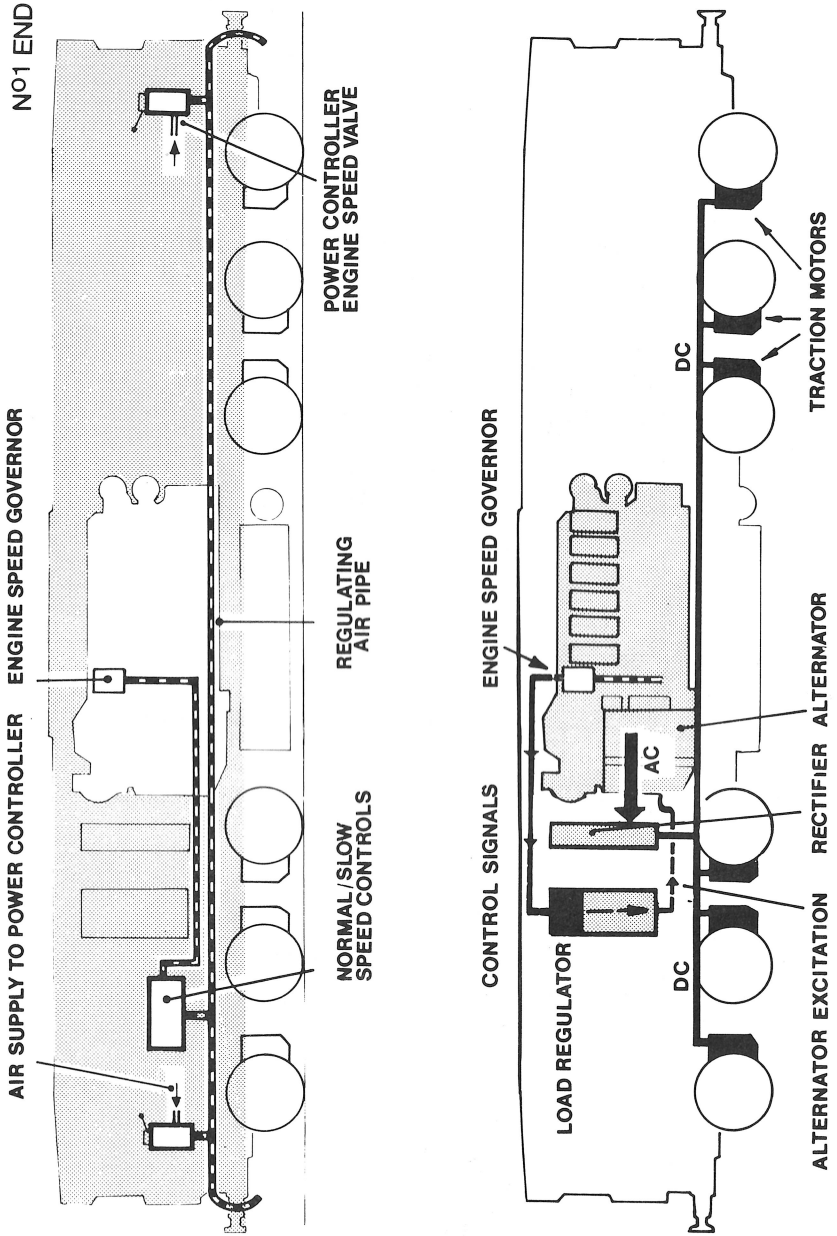


Fig. 19 Auxiliary Power – Simplified

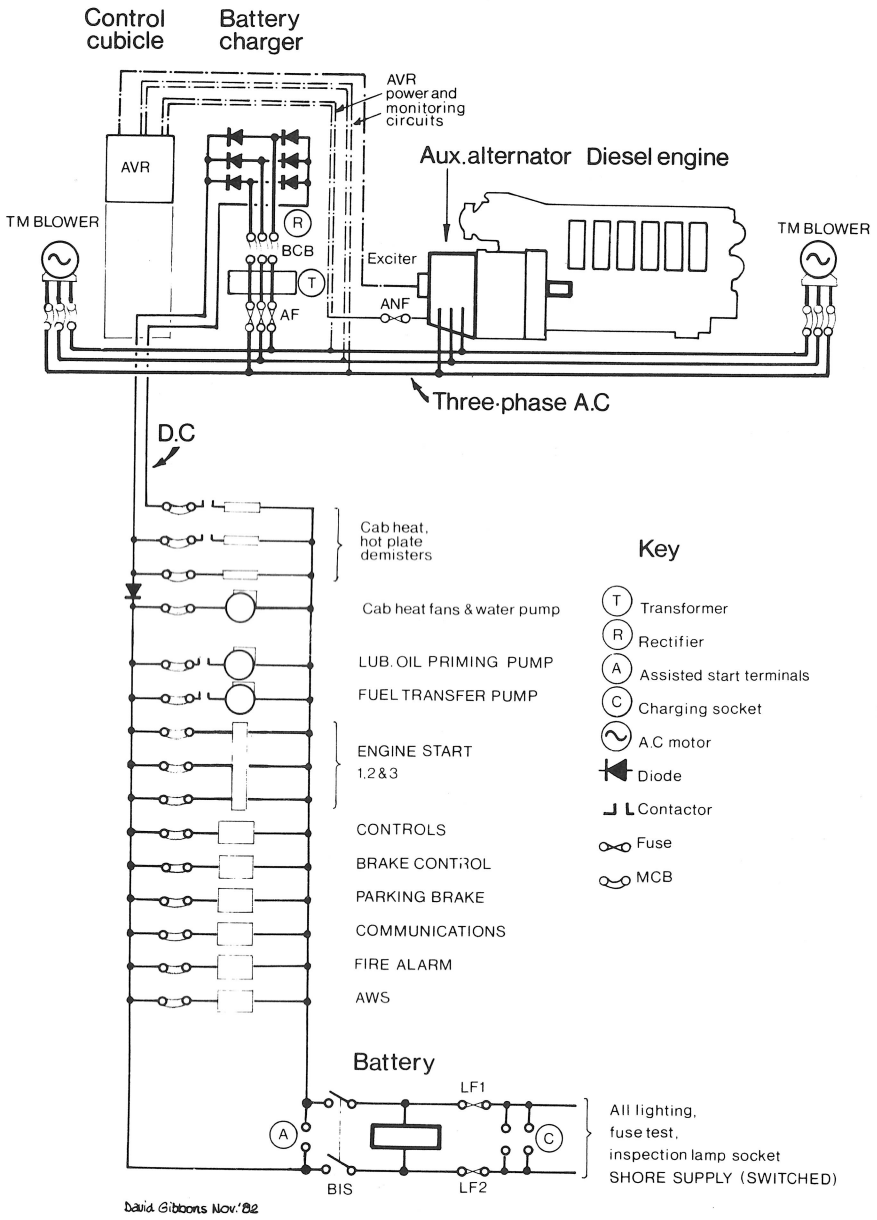
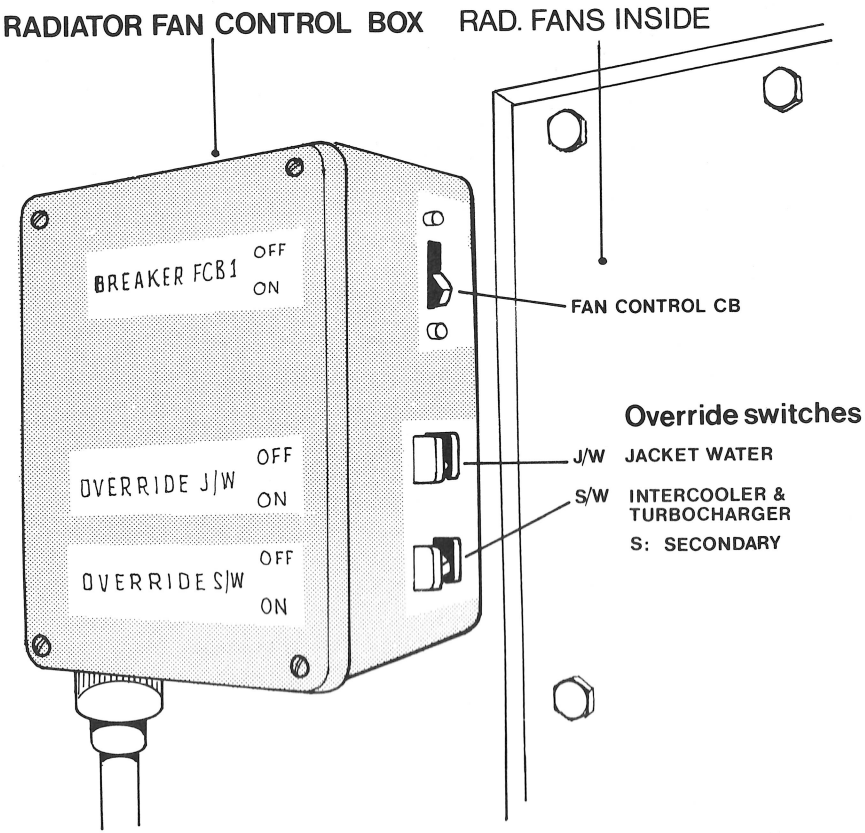


Fig. 20 Radiator Fan Control Box



5. TRACTION POWER (see Fig. 21 page 32).

5.1 Locomotives 58001 to 58049

The traction motors are normally connected in 'series-parallel' but when slow speed is selected additional motor contactors MC7 and MC8 enable the six motors to be connected in 'all series'. It should be noted that the motors are specially 'paired' electrically i.e. 1 and 6 - the outer-most axles, 2 and 5 - centre axles of each bogie and 4 and 3 - the inner-most axles. There are electrical advantages in this arrangement, particularly in dealing with the problems of weight transfer and wheel-slip when starting away with a heavy load.

This 'all series' arrangement for slow speed working is only available when the motor isolating switch is at the NORMAL position.

5.2 Locomotive 58050 (see Fig. 22 page 33).

This locomotive is the subject of an experiment, sponsored by Brush Electrical Machines Ltd., in that the traction motors are separately excited - which has led to the title SEP-EX being adopted for this locomotive.

The main three-phase alternator output is supplied to a converter unit within the main control cubicle, which comprises eight three-phase, fully-controlled, thyristor bridge rectifiers which convert the a.c. output of the alternator to a d.c. supply for the traction motors.

Six of the rectifiers, usually referred to as the Armature Converters, supply each of the traction motor armatures whilst the remaining two supply all the traction motor fields and are therefore known as the Field Converters. The field converters control not only the strength of the field currents but the direction of flow of that current which therefore determines the direction of rotation and therefore of travel. This means that only one of the two field converters is in use at any one time i.e one is used for the forward direction, the other for reverse.

This arrangement allows the individual traction motor armature currents, and the field current of all traction motors, to be independently controlled. This is particularly important when automatic correction of wheelslip is considered.

Fig. 21 Traction power

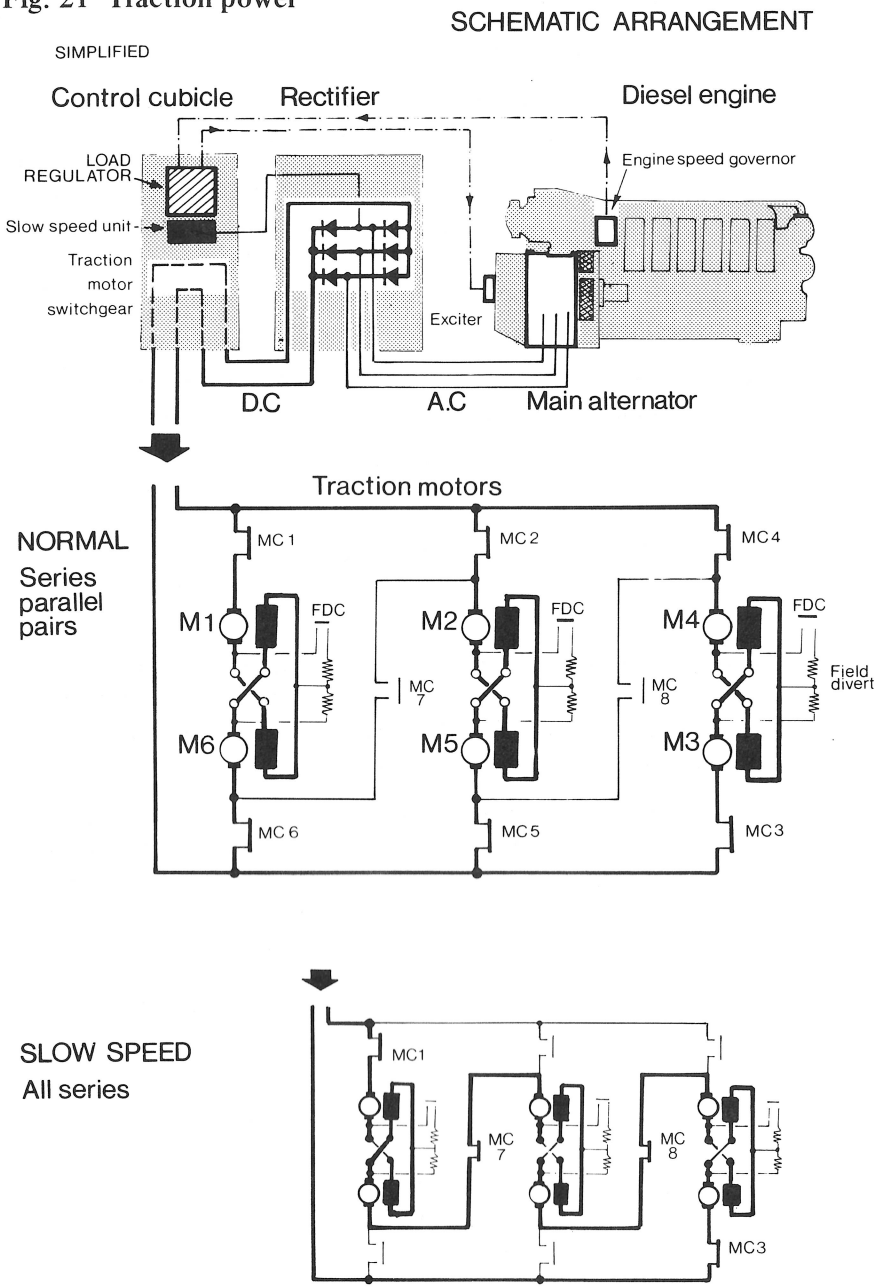
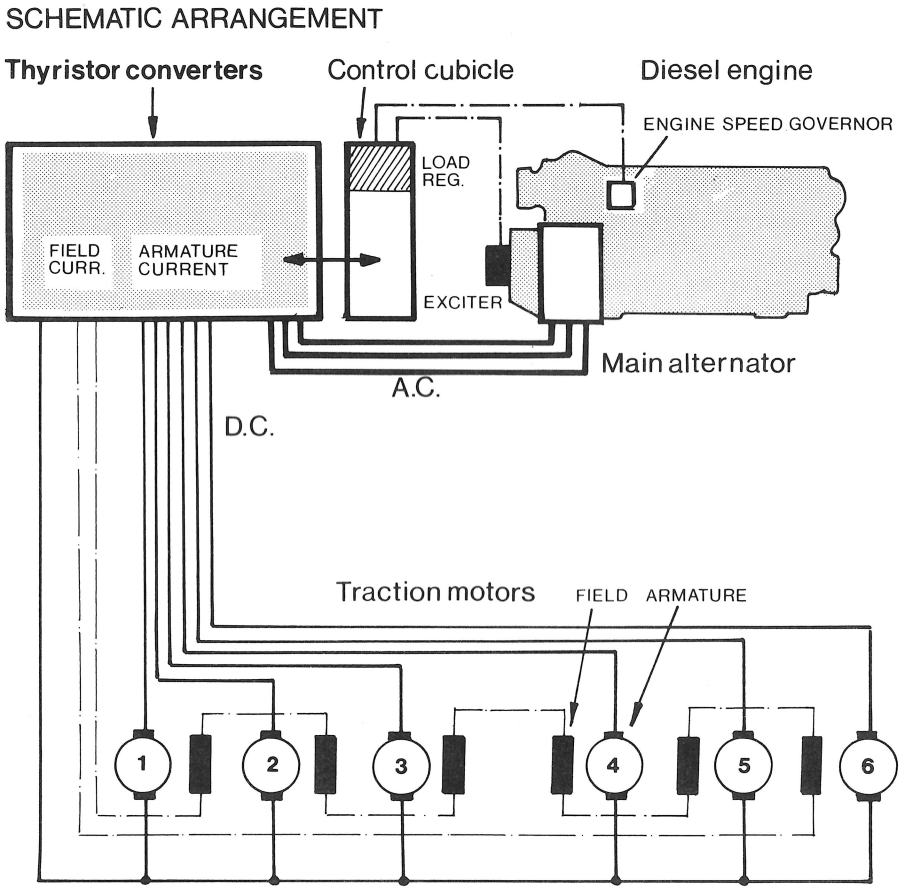


Fig. 22 Traction Power - with 'Sepex' motors



Wheelslip **detection** is undertaken by comparing the speed of each individual axle of the locomotive with the actual speed of the locomotive. A speed probe on each axle sends signals to a Comparator unit which also receives signals from a radar unit mounted beneath the driving position at each end of the locomotive. Thus if, say, No. 1 wheelset loses adhesion and slips, the comparator will immediately receive a signal from the speed probe on that axle of an increase in speed. This signal is instantly compared with that obtained from the radar unit (the actual speed of the locomotive) and **corrective** action is immediately taken when they are found to be at variance.

This is where the SEP-EX system comes into its own as the electronic control system, employing a computer, instantly corrects the wheelslip by reducing the armature current **of No. 1 traction motor only** by an amount sufficient to stop the wheelslip and restore adhesion between wheel and rail. The fact that the field current to all motors, and the armature current to motors No. 2 to No. 5, is not affected means that the locomotive will still be producing a considerable tractive effort from the remaining five motors whilst corrective action is being taken to deal with No. 1 axle. This will considerably reduce, if not eliminate, the slipping problems which have beset the Class 58 locomotives under poor rail head conditions.

6. ENGINE SPEED CONTROL

6.1 Control is by regulating air pressure determined by the angular position of the driver's power controller (see Fig. 23 page 36), and variable between 0 and 3.3 bar by a cam-operated accelerator valve. The system is similar to that used on the Class 56 locomotive in that two Engine Speed Valves (ESV1 and ESV2) are fitted together with pressure regulators.

These provide the facility to:-

(a) Run the engine at a reduced maximum r.p.m. to enable main reservoir pressure to be obtained more quickly.

(b) Automatically restrict the maximum engine r.p.m. in the event of isolation of a pair of traction motors or the failure of either traction motors or the failure of either traction motor blower.

6.2 For normal train working regulating air pressure is supplied to the engine speed changeover valve (and via the buffer beam air hoses to another locomotive if in multiple) and thence through both engine speed valves to the engine speed governor (see Fig. 21 upper page 32).

6.3 When slow speed is selected (see Fig. 24 lower page 37) the engine speed changeover valve is energised to allow air at 0.4 bar, as determined by the slow speed pressure regulator, to pass via ESV1 and ESV2 to the governor. Note that the power controller is 'dead' in the sense that its position has no influence on engine r.p.m. when in this slow speed condition, the regulating air pipe being isolated by the changeover valve.

6.4 With the master switch at ENGINE ONLY the angular movement of the power controller is limited by a mechanical stop and regulating air pressure is fed via the engine speed changeover valve and ESV1 to another pressure regulator with an output of 1.7 bar. This passes via ESV2 to the engine speed governor (see Fig. 25 upper page 38).

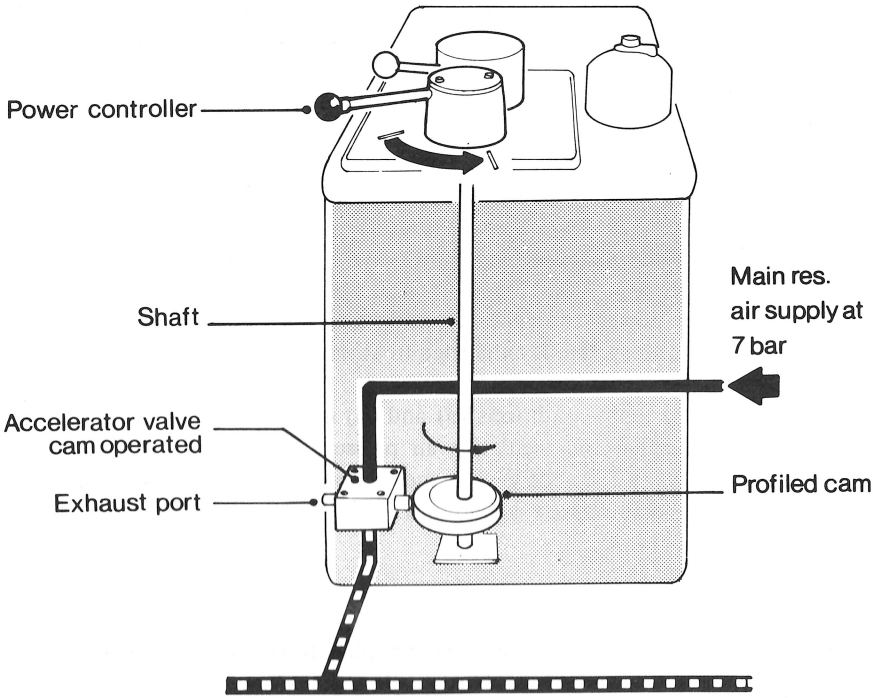
6.5 With the power controller at OFF (see Fig. 25 lower page 38) the regulating air system is exhausted to atmosphere as indicated.

6.6 Under the fault conditions (a) and (b) mentioned in 6.1 above ESV2 is de-energised and regulating air pressure from the power controller handle passes from ESV1 via the 1.7 bar pressure regulator to ESV2 and the engine speed governor i.e. as the upper drawing of Fig. 25 page 38).

7. HYDRAULIC PARKING BRAKE

7.1 The hydraulic (oil) parking brake applies to the left hand wheels only of axle 2 and axle 3 on No.1 bogie under the control of the parking brake unit situated in the cross corridor at No.2 end (see Fig. 26 page 39). The normal control is from 'apply' and 'release' push buttons in the driving compartments although provision is made for manual release and application by a hand-operated pump (see Fig. 12 page 17) in the event of electrical failure.

Fig. 23 Power Controller



Principle;
raise engine speed by increasing reg. air pressure

Fig. 24 Engine Speed Control 1

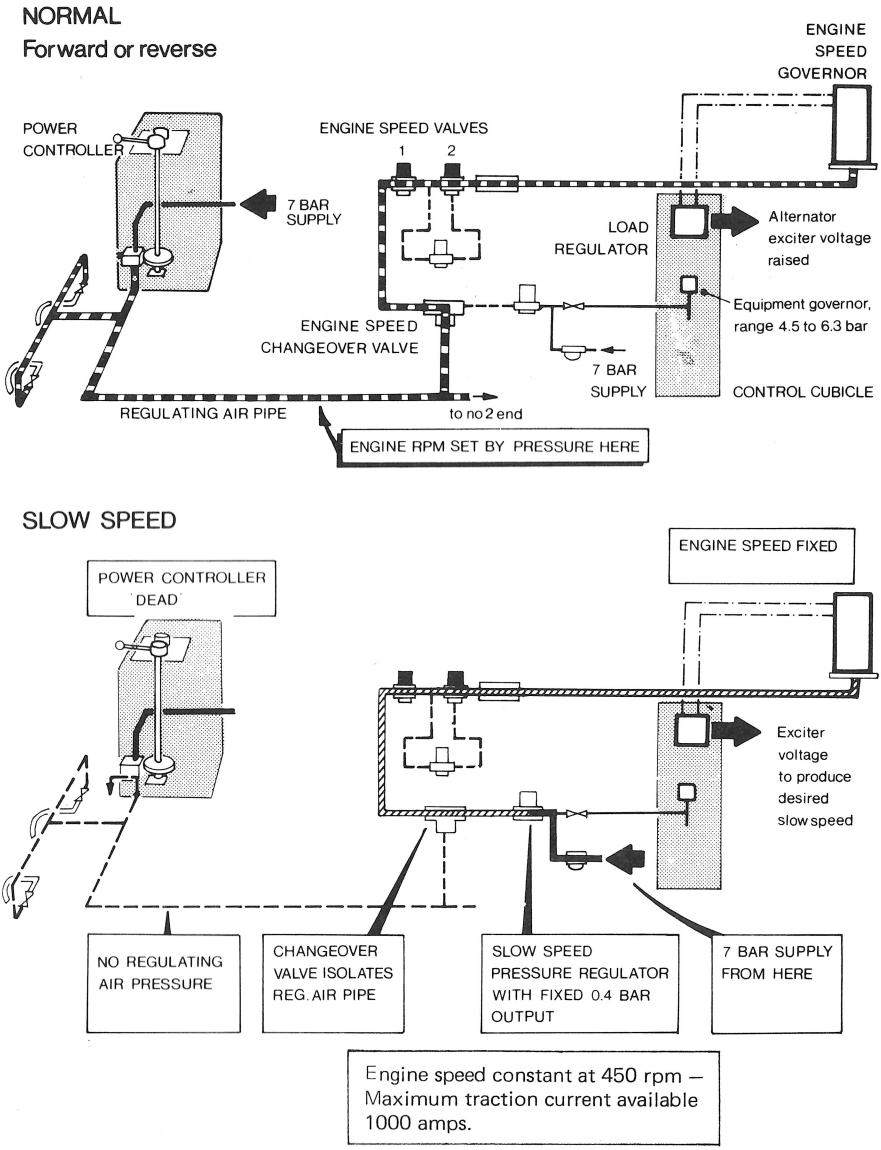


Fig. 25 Engine Speed Control 2

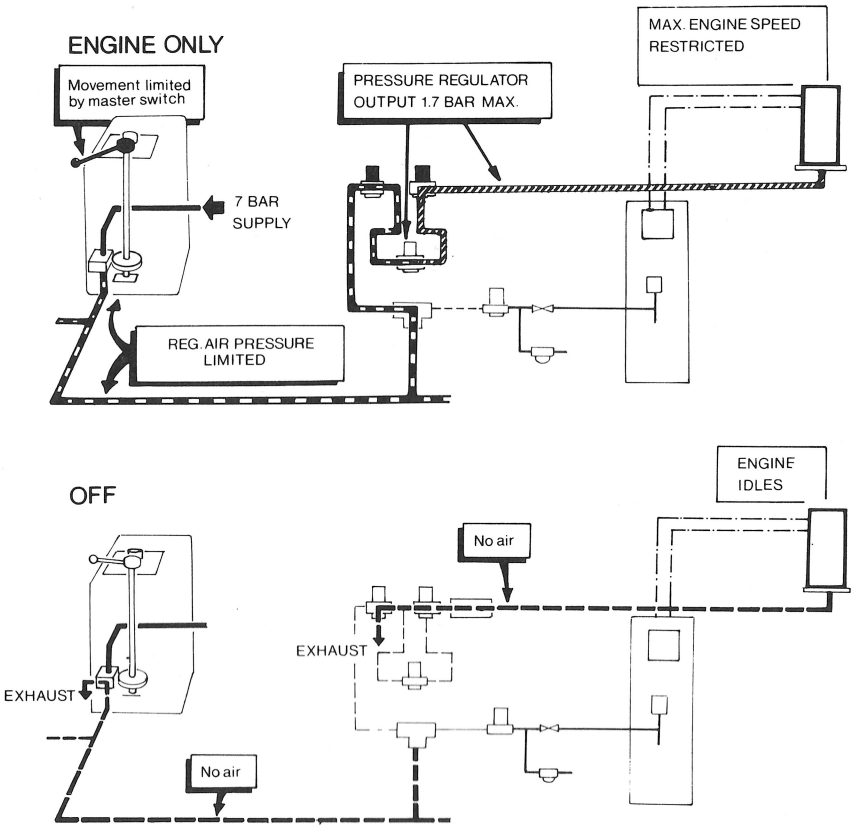


Fig. 26 Hydraulic Parking Brake

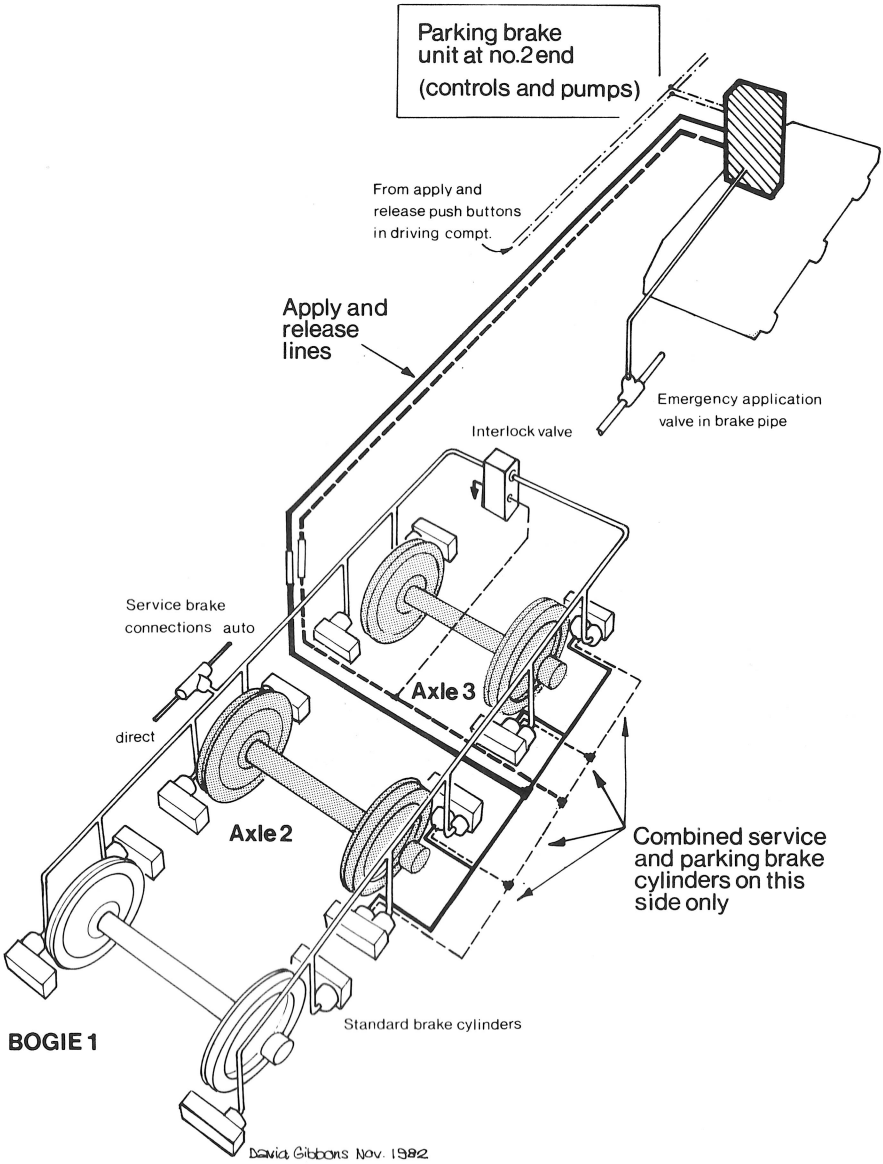
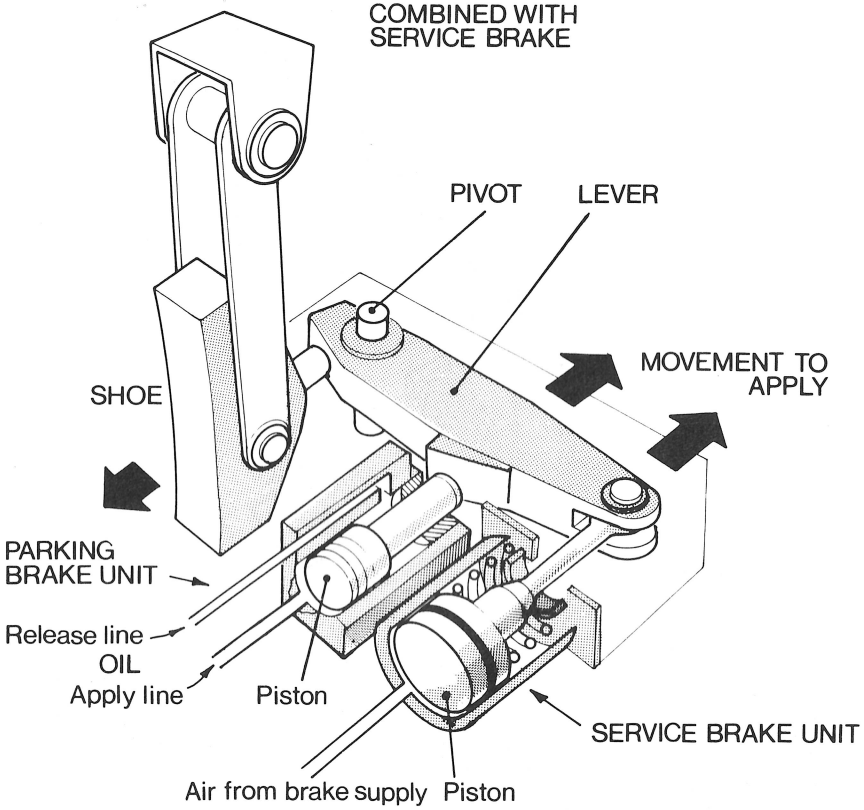


Fig. 27 Hydraulic Parking Brake Actuators



7.2 To prevent 'compounding' of the power brake and the parking brake an interlock valve is fitted. If the parking brake is applied when a power (air) brake application already exists e.g. when stabling the locomotive, this valve will vent the air pressure from all six brake cylinders on the left hand side of No.1 bogie as hydraulic pressure is established in the parking brake actuators. Conversely if the parking brake is released when the power brake is applied e.g. when one is about to move the locomotive, as the hydraulic pressure is released the interlock valve restores air pressure to the six brake cylinders.

7.3 If an attempt is made to move the locomotive with the parking brake still applied then a Parking Brake Interlock Magnet Valve (PBIMV) within the parking brake unit is de-energised when the speed reaches approximately 6 m.p.h. The PBIMV exhausts air pressure from the Emergency Application Valve (EAV) which in turn vents the brake pipe to atmosphere.

In normal circumstances when the parking brake is applied with the locomotive stationary the PBIMV is kept energised to maintain air pressure to the EAV and thus enable the brake pipe to be charged.

7.4 The parking brake indicators in the driving compartments are electrically operated and display ON, OFF or STRIPES (neutral). Their indication is determined by a limit switch which senses the application and release movements within the parking brake unit cupboard. When locomotives are in multiple the 'apply' and 'release' buttons in the driving compartments activate the parking brake only on the locomotive on which they are depressed i.e. there is no through control via the jumper cables.

7.5 To release the parking brake manually the operating handle, kept on brackets just inside the clean air compartment, is fitted to the square spindle in the 'cut-out' at the bottom of the cupboard door. The manual over-ride button must then be held depressed whilst pumping takes place until the adjacent indicator shows the desired position i.e. OFF.

7.6 The parking brake actuators use the same linkage as the normal air pistons and the principle is illustrated in Fig. 27 page 40.

8. THE COMPRESSED AIR SYSTEM.

8.1 Basic Air System (Fig. 28)

The two compressors are located in the radiator compartment at No.1 end and are belt-driven from pulleys located on the drive shaft from the free end of the diesel engine. The compressors are therefore running all the time the engine is running. When main reservoir is built up to 10.0 bar this pressure is detected by the pneumatic compressor governor, which opens the unloader valves to atmosphere so that the compressors run 'light' in that they are only 'dumping' the air.

When the main reservoir pressure had dropped to 9.0 bar the compressor governor will pneumatically close the unloader valves and so reconnect the compressors to the system.

Note that check valves are provided to prevent a back flow of air pressure from the reservoirs when the compressors are unloaded, or when they are stopped.

Isolating cocks are provided to close the connection to atmosphere in the event of failure of either unloader valve and the system is then protected by a safety valve set to blow off at 10.7 bar.

The main reservoirs supply the brake frame and a pressure regulator set at 7.0 bar. The low main air governor closes at 6.0 bar rising to activate the DSD and traction control circuits, and opens at 4.5 bar falling to cut off (or prevent the taking of) traction power and to initiate (or prevent the release of) a DSD brake application.

The 7.0 bar supply from the pressure regulator feeds the direct air brake valves and other equipment as indicated, as well as the main reservoir pipe via a duplex check valve. This valve closes if the main reservoir pressure falls to 5.0 bar to prevent further loss of pressure below this safe value in the event of a defect such as a burst main reservoir pipe hose. It has a reverse-feed capability so that the main reservoirs may be charged from the main reservoir pipe should the need arise e.g. failure of the diesel engine.

8.2 Brake Frame (Fig. 29)

The main reservoirs charge the brake supply reservoirs and hence the two distributors i.e. one for each bogie, which are of the vehicle type incorporating an isolating cock on the side.

Fig. 28 Basic Air System

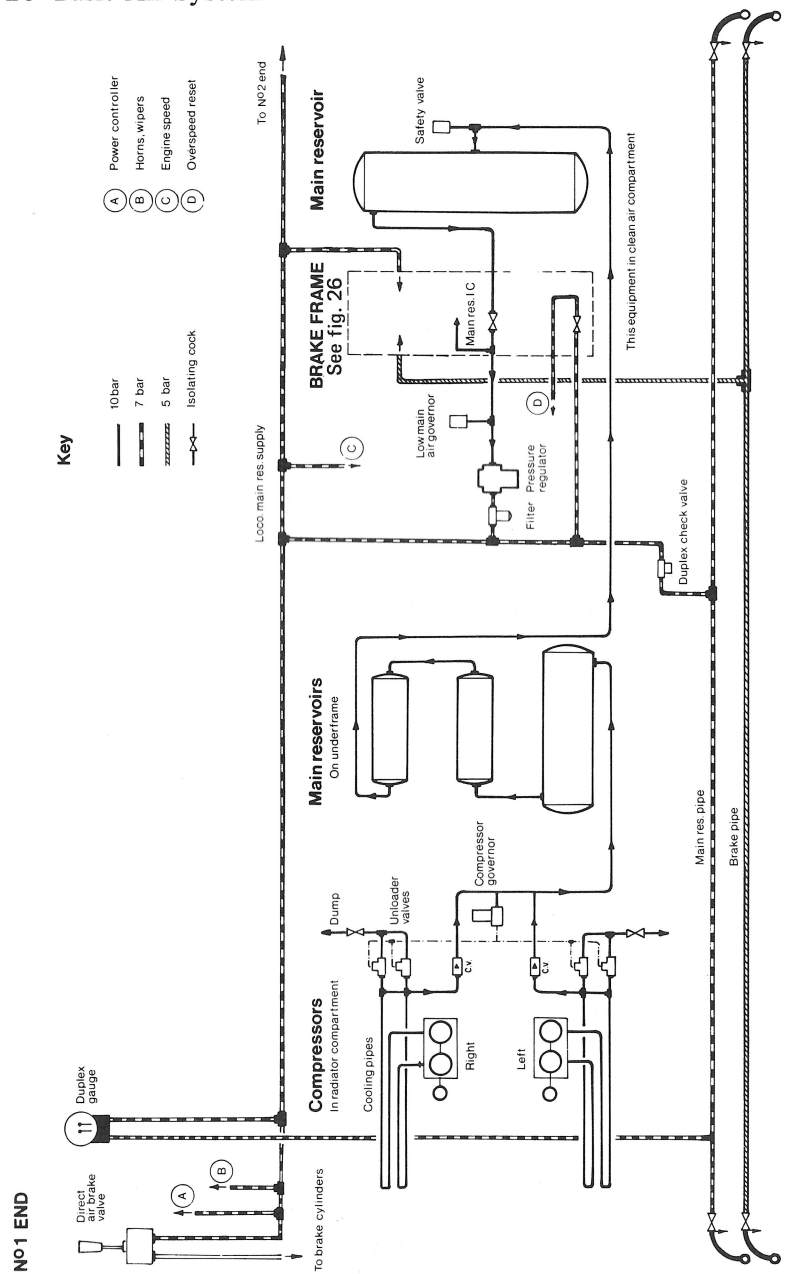
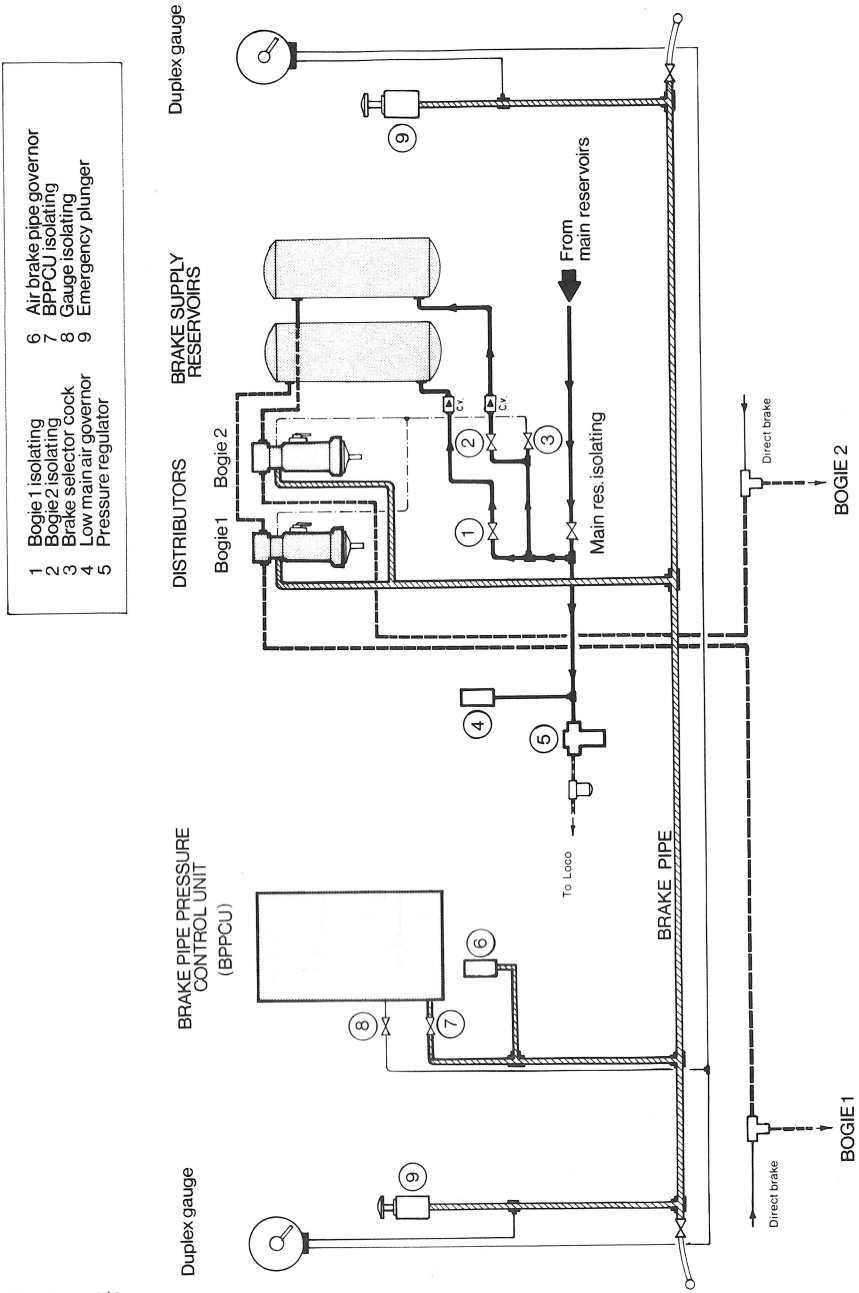


Fig. 29 Brake frame



Note that although isolating cocks labelled 'Auto Air Brake' are provided for each bogie, (1) and (2) on Fig. 29, they in fact isolate the brake supply reservoirs from the main reservoir system and to fully isolate the automatic air brake on either or both bogies it is necessary to isolate the appropriate distributor(s) and operate the release valves as well.

The brake pipe pressure control unit, as the name implies, charges or reduces the pressure in the brake pipe to control the automatic air brake. The operation of the P.B.L. automatic air brake system is described in detail elsewhere.

8.3 Bogie Air Connections & Direct Brake (Fig. 30)

The direct air brake valve is of the 'joystick' type and when pushed forward to the APPLY position passes air from the main reservoir supply (7.0 bar) direct to the locomotive brake cylinders. Note that the maximum brake cylinder pressure is set at 5.0 bar by the pressure limiter valves (2) and that release of pressure from the bogie brake cylinders, is via check valves (3) and the brake valve itself.

The straight air brake isolating cocks, which are self-venting, are in the connections to the appropriate bogie.

9. TO MOVE A LOCOMOTIVE IN DEPOTS, YARDS, ETC. BEFORE ENTERING TRAFFIC.

9.1 The locomotive must either have been prepared in accordance with the instructions in BR.33056/90, or taken over in a fully prepared condition.

9.2 If the movement does not immediately follow preparation then check that:-

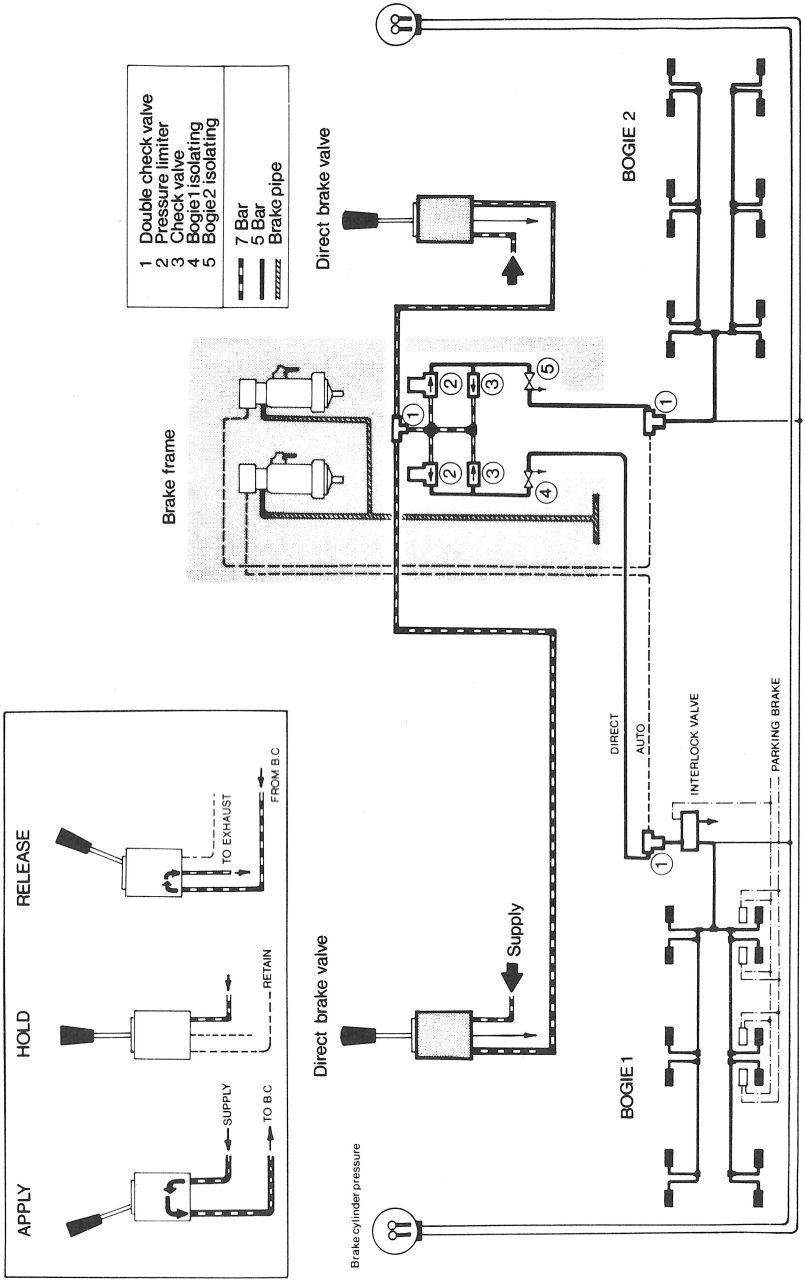
9.2.1 The auto-air brake applies fully when the controller is held in the APPLY position.

9.2.2 The direct air brake applies fully when the brake valve is moved to the APPLY position.

9.2.3 The brake cylinder pressure rises on both bogies to its maximum on each of the above applications.

9.2.4 The repair book contains no serious defects that have not been signed off.

Fig. 30 Bogie Air Connections and Direct Brake



9.2.5 No depot pipes and cables are connected, that no NOT TO BE MOVED targets or red flags are attached and that NO STAFF are working on, adjacent to, or underneath the locomotive so far as can be seen.

9.2.6 Check that all scotches are removed.

9.3 Make a holding application of the direct air brake and release the parking brake.

Note: When locomotives are in multiple it is necessary to check that the parking brake is released on the rear locomotive.

9.4 Ensure that no other traction units, vehicles or equipment are foul.

9.5 When ready to move, depress the D.S.D. pedal and move the master switch to FORWARD or REVERSE as required and release the direct air brake. Move the power controller handle to a 'power' position and check that traction current is registered on the ammeter.

NOTE: POWER MUST NOT BE APPLIED IF THE LOCOMOTIVE IS MOVING IN THE DIRECTION OPPOSITE TO WHICH THE MASTER SWITCH IS POSITIONED.

10. ATTACHING TO A TRAIN

NOTE: THIS OPERATION MUST BE PERFORMED FROM THE DRIVING COMPARTMENT NEAREST TO THE TRAIN.

10.1 Approach the train and stop when the gap between the buffers is 6 feet.

10.2 On receiving a hand signal from the person who is to couple up, apply the minimum power and make gentle contact with the train.

10.3 Use additional power to compress the buffers and then apply the direct air brake. Immediately the direct air brake application is established move the power controller handle to OFF.

10.4 Change ends in accordance with the instructions in BR.33056/90 but in addition check that the coupling operation has been performed correctly.

11. TO MOVE A LOCOMOTIVE WITH A TRAIN ATTACHED INTO SERVICE.

NOTE: A brake continuity test must be undertaken.

11.1 Make a holding application of the direct air brake and release the auto-air brake.

11.2 Depress the D.S.D. pedal and move the master switch to FORWARD.

11.3 On receiving the signal to start, release the direct air brake and note that the brake cylinder pressures fall towards zero. Move the power controller to a 'power' position and note that traction current is registered on the ammeter.

POWER MUST NOT BE APPLIED IF THE LOCOMOTIVE MOVES IN THE OPPOSITE DIRECTION TO WHICH THE MASTER SWITCH IS SET.

11.4 If the train is standing on a rising gradient, or the locomotive has moved in the opposite direction to that set by the master switch, then the power controller must be moved to a 'power' position and when traction current has been established the direct air brake must be gradually released. The right combination of traction current and graduated release of the direct air brake will be found by experience and Drivers must take into account the gradient, load of the train, rail conditions etc.

IF, AT ANY TIME WHEN POWER IS APPLIED, THE WEIGHT OF THE TRAIN BRINGS THE MOVEMENT TO A STAND OR THE TRAIN MOVES BACK IN THE OPPOSITE DIRECTION TO THAT INTENDED, THEN THE POWER CONTROLLER MUST IMMEDIATELY BE CLOSED AND A SIMULTANEOUS FULL APPLICATION OF THE AUTO-AIR BRAKE MUST BE MADE.

If the load of the train is in accordance with that specified in the Working Manual for Rail Staff BR.30054 then the train should be checked for dragging brakes etc. before any repeated attempts to start the train are made.

11.5 When rail conditions are poor then the sander button on the end of the power controller handle should be held depressed whilst the handle is opened. The button should not be released until it is judged that wheel/rail adhesion is satisfactory.

In slow speed, when rail conditions are very poor, it is advantageous to make a 1.0 bar direct air brake application i.e. in lieu of an anti-slip brake. This has the effect of 'holding back' a slipping axle.

11.6 As an alternative to the use of sand, or in extreme cases to supplement it, the slow equipment may be used to start a heavy train on a rising gradient or when rail conditions are poor.

Move the slow speed switch on the power controller pedestal to SLOW SPEED and move the slow speed selector switch on the instrument panel to position 1. When the power controller is opened to the ON position a fine degree of traction current control may be obtained by moving the selector switch progressively through positions 2, 3 and 4 (with the power controller remaining in the ON position) until a balancing speed is reached. On an average gradient this will be around 7 to 8 m.p.h. and this should provide sufficient momentum to keep the train moving whilst the power controller is closed and the slow speed switch is returned to NORMAL, prior to reopening the power controller and establishing normal traction current determined by the controller position.

12. BRAKING OF A TRAIN IN SERVICE

12.1 In general braking should be in accordance with the Instructions contained in BR.33056/3 although the auto-air brake controller is of the 'joystick' type and is operated as described in Clause 2.4 page 11 of this publication.

The direct air brake valve is of a similar type and is again described in Clause 2.4.

13. TO REVERSE THE LOCOMOTIVE

13.1 Return the power controller handle to OFF.

13.2 Apply the brakes to hold the locomotive stationary.

DO NOT ATTEMPT TO REVERSE WHEN THE LOCOMOTIVE IS MOVING.

13.3 Move the master switch to the opposite direction of travel.

13.4 Release the brakes and open the power controller handle as required.

14. TO OPERATE THE SLOW SPEED CONTROL EQUIPMENT

14.1 With the engine running and the master switch at ENGINE ONLY, move the slow speed selector switch to the required position.

i.e. position 1 for 0.5 m p.h.
position 2 for 1.0 m.p.h.
position 3 for 2.7 m p.h.

NOTE: **The use of position 4 is described in Clause 11.6 page 49.**

14.2 Move the slow speed switch on the power controller to SLOW SPEED.

14.3 Depress the D.S.D. pedal, move the master switch to FORWARD and open the power controller handle to the ON position.

14.4 When slow speed control is no longer required move the power controller handle to the OFF position and return the slow speed switch on the power controller pedestal to NORMAL.

NOTES:

1. **IF, WHEN RAIL CONDITIONS ARE VERY POOR, THE LOCOMOTIVE COMES TO A STAND THE DRIVER SHOULD CLOSE THE POWER CONTROLLER TO 'OFF' AND THEN REOPEN IT TO 'ON'. THE TRACTION CURRENT WILL THEN SLOWLY RE-ESTABLISH AND ADHESION WILL BE MAINTAINED.**
2. **IF, FOR ANY REASON, THE DIESEL ENGINE IS TO BE STOPPED OR STARTED WHEN THE LOCOMOTIVE IS SET FOR SLOW SPEED OPERATION THEN THE SLOW SPEED SWITCH MUST BE RETURNED TO 'NORMAL' BEFORE THE STOP OR START BUTTON IS PRESSED.**

15. LEAVING A LOCOMOTIVE ON A RUNNING LINE

15.1 If it is necessary to carry out Rules or other duties which are away from the immediate vicinity of the train then:-

15.1.1 Depress the emergency brake plunger.

15.1.2 Move the master switch to OFF, remove and retain the master key.

15.1.3 Apply the parking brake.

16. DETACHING THE LOCOMOTIVE FROM A TRAIN

16.1 Depress the emergency brake plunger.

16.2 Indicate to the person that is to uncouple that the air hoses may be uncoupled.

16.3 When that person indicates that the air hoses have been uncoupled and the locomotive air brake pipe cock has been closed, and that the buffers may be compressed, raise the emergency brake plunger.

16.4 When the locomotive brakes have released move the master switch to the direction required to 'ease up', apply sufficient power to compress the buffers, apply the direct air brake and IMMEDIATELY move the power controller handle to OFF.

16.5 When the person has completed the uncoupling operation, and has given a hand signal to 'draw away', move the master switch to the required direction, release the direct air brake and move the locomotive away as required.

NOTE: If the train is not fitted with continuous brakes then the person who is to uncouple will apply sufficient hand brakes to hold the train whilst buffers are compressed.